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ANALYSIS OF HYDROLOGIC DATA
GATHERED IN 1984 FOR THE
DUBLIN STUDY AREA

Prepared For:

THE BOROUGH OF DUBLIN
BUCKS COUNTY, PENNSYLVANIA



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ORIGINAL
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INTRODUCTION

The Borough of Dublin has been granted an operating permit from the Delaware River Basin Commission (DRBC) to produce water from their Dublin #1 and #2 wells. Since this permit was approved on December 12, 1984, the Borough has been required to monitor the hydrologic environment in the watersheds influenced by these wells.

Prior to permit demands, the Borough of Dublin initiated the monitoring program, in the early part of 1984, to obtain as much information as possible for fully evaluating the groundwater resources available to the Borough. This report represents a compilation and analysis of all available hydrologic data collected to date.

The purpose of this hydrologic study is to determine the condition of the groundwater reserves in and around the Borough. The ultimate goal is to develop an optimum production schedule for the Dublin #1 and #2 wells so that withdrawals will not adversely affect surrounding groundwater consumers or stream flows.

In addition, the results of this study can be applied to improving the existing operation of the Dublin #1 well. By understanding the water conditions in the area, the most effective well network can be developed and accurately presented to the D.R.B.C. for continued permitting of the wells.

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Recommendations are provided for improving the groundwater situation in the area and for supporting the decision of the Borough of Dublin to develop a community-wide water system.

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MONITORING PROGRAM

MONITOR WELL MEASUREMENTS:

To date, the water levels in 56 private and borough wells in and around the borough have been measured periodically (Figure 1). The borough is presently required to measure these wells quarterly, and if drought conditions occur, certain "key" wells are to be measured on a more frequent basis. Appendix I provides a compilation of this data and indicates where and when the measurements were made.

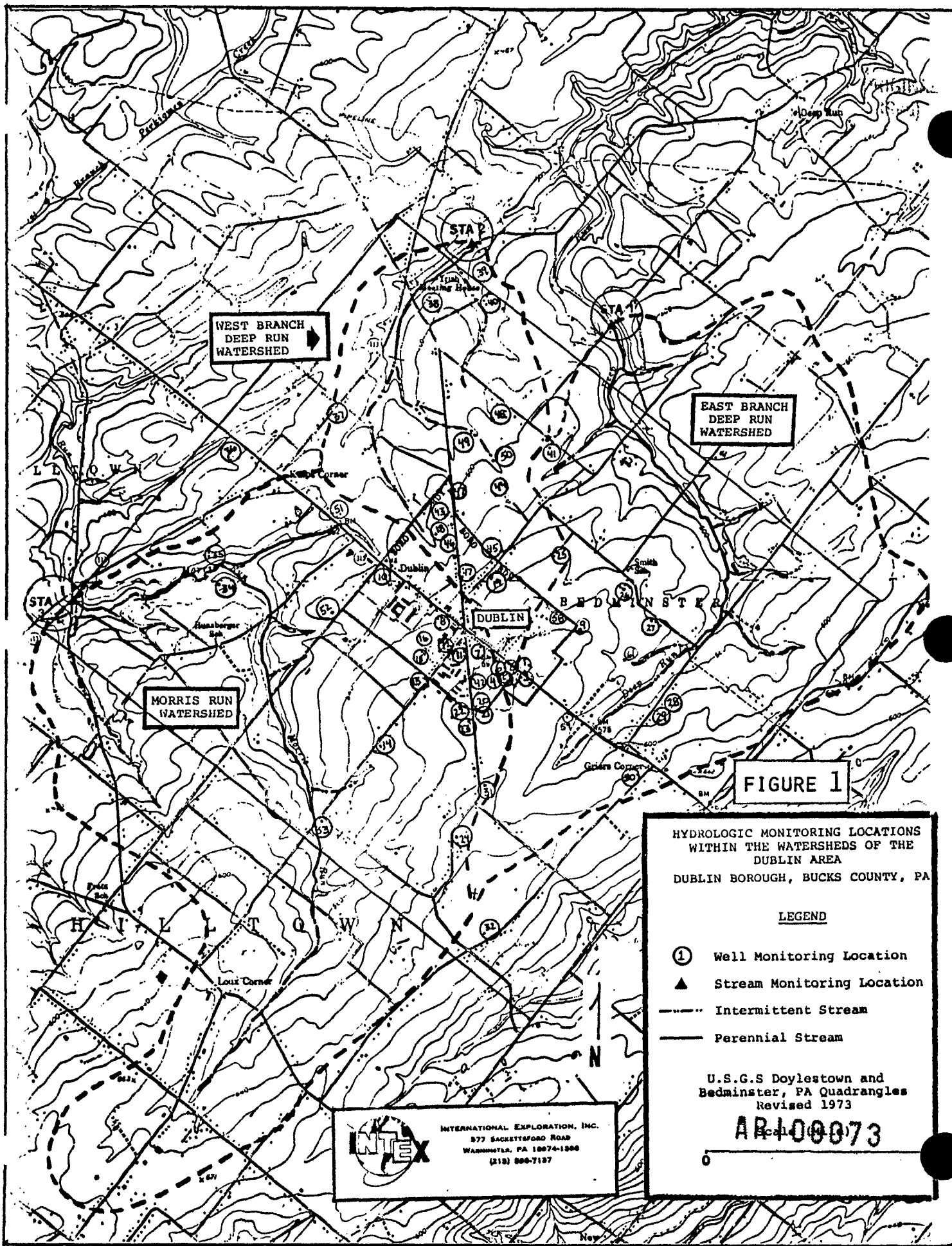
Well water levels were gathered to develop groundwater contour and depth to water table maps. These maps can be used to determine groundwater flow directions, areas of high groundwater consumption and warn of regions where groundwater levels are lowering to depths which may affect shallow wells.

STREAM FLOW MEASUREMENTS:

Three stream monitoring stations have been developed to measure water levels and total stream discharge. Each is positioned so as to monitor stream flow from one of the three watersheds in which the Borough of Dublin is situated (Figure 1). Appendix II is a compilation of this data and indicates when stream flow measurements have been made.

Stream flow discharges were measured primarily during base flow conditions, which is the period when stream flow is supplied

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only be groundwater discharge. The "Water Resources Study of the Dublin Area" report determined that base flow conditions would exist whenever at least 4 days had past since appreciable rainfall or snowmelt occurred. Base flow measurements are an important means of determining recharge rates to the groundwater system. Base flow rates are commonly 25 to 47 percent smaller than recharge rates and are thus a conservative estimate of the amount of available groundwater moving through the shallow aquifer system (Wright, R.E. & Associates). The D.R.B.C. currently employs base flow rates as the method for calculating groundwater recharge rates in the hydrologic budget.

Base flow rates fluctuate appreciably over a yearly period as a result of the influences of precipitation, transpiration by plants and the withdrawals of groundwater by wells. Thus, base flow measurements were made monthly, along with water level readings. From this data, a yearly average base flow value can be obtained. In addition, with enough data, a stream level to discharge graph can be constructed to allow gauge readings to be converted to stream flow. This will reduce the need to directly measure stream discharge and thus substantially reduce field expenditures.

DUBLIN PRODUCTION WELL MONITORING

Daily well production totals have been recorded in 1984 and since June 20, 1984, daily water level readings have been made on the Dublin #1 and #2 wells. Water levels have been measured using

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an "M-scope" measuring device. Pumping level measurements are usually recorded at the end of the pumping cycle and represent a close approximation to the maximum pumping level. The scheduled installation of a continuous water level recorder will further improve the system. The compilation of data is presented in Appendix III.

By monitoring production well water levels in relation to well discharge and base flow measurements, an understanding can be developed of the influences that precipitation and well withdrawals have on the well water levels. Historical data can be used to forwarn of adverse drawdown affects in sufficient time to prevent or reduce the chances of such an event occurring.

Precipitation

The National Oceanographics and Atmospheric Administration (NOAA) operates a precipitation measuring station in Doylestown, Pa. This information has been compiled and is presented in Appendix VI. The data can be used to consider the influence which precipitation has had on the hydrologic conditions in the area.

The information indicates that 1984 had an extremely wet spring and summer with precipitation above average. From August through December of 1984, precipitation was below monthly averages.

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ANALYSIS OF DATA

WATERSHEDS

Surface Watershed: Figure 1 shows the three watershed basins which drain the Dublin area. Surface runoff, which generally accounts for approximately 27 percent of precipitation in these basins, is influenced directly by surface topography (Wright, R.E.). The steepness or gradient of the stream draining the watersheds affects runoff rates, as does soil, vegetation and impermeable surfaces, such as parking lots or frozen ground. Stream gradients for each of the three watersheds, from their headwaters to the monitoring station points are presented in Table 1.

TABLE 1

Stream Gradients and Drainage Areas

	<u>Gradient (ft/mi)</u>	<u>Drainage Area (mi²)</u>
East Branch of Deep Run	39.6	3.47
West Branch of Deep Run	90.816	1.44
Morris Run	66.42	4.86

The information indicates that the West Branch of Deep Run has the highest stream gradient while the East Branch has the lowest.

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Groundwater Basins

Subsurface groundwater movement can differ significantly from surface water flow. This may occur as a result of bedding, fractures and pumping effects. Figures 2 and 3 represent groundwater contour maps for high and low water table conditions in 1984. Onto these maps are drawn the inferred subsurface groundwater divides for the Deep Run and Morris Run Basins.

The results suggest that the groundwater divides between Morris and Deep Run generally follow surface watershed divides through Dublin Borough. Subtle differences certainly do exist, but the limited data prevents detailed definition of groundwater contours; especially in the southern portion of the watersheds.

Of interest is the expansion of the West Branch of Deep Run groundwater watershed into the East Branch area during dry periods. This may explain why the June base flow rates for the East Branch are higher than the West yet they are lower during December. This may have occurred as a result of high groundwater consumption in the Stonebridge area.

The important point here is that the Dublin #1 well and Dublin Borough straddle the groundwater and surface watershed divides of the Morris and Deep Run Basins. Therefore, approximately half of all of Dublin Borough's water consumption, on the whole, comes from each of the two watersheds. It must be realized by both Bedminster and Hilltown Townships that the respective Deep and Morris Run Basins, which exist in the Townships, are hydrologi-

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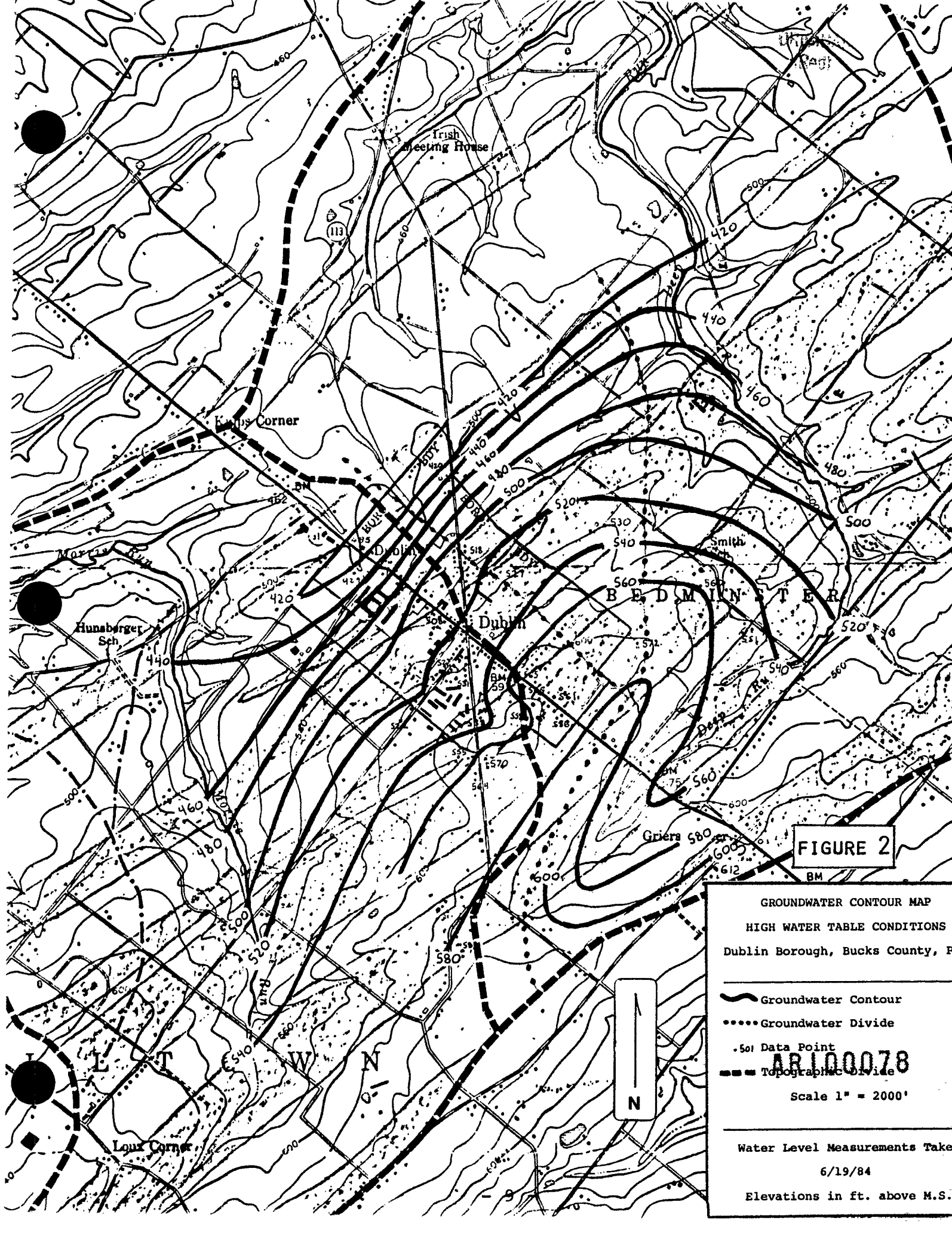


FIGURE 2

GROUNDWATER CONTOUR MAP
HIGH WATER TABLE CONDITIONS
Dublin Borough, Bucks County, P/

- Groundwater Contour
 - Groundwater Divide
 - .50' Data Point
 - Topographic Divide
- Scale 1" = 2000'

Water Level Measurements Take
6/19/84
Elevations in ft. above M.S.

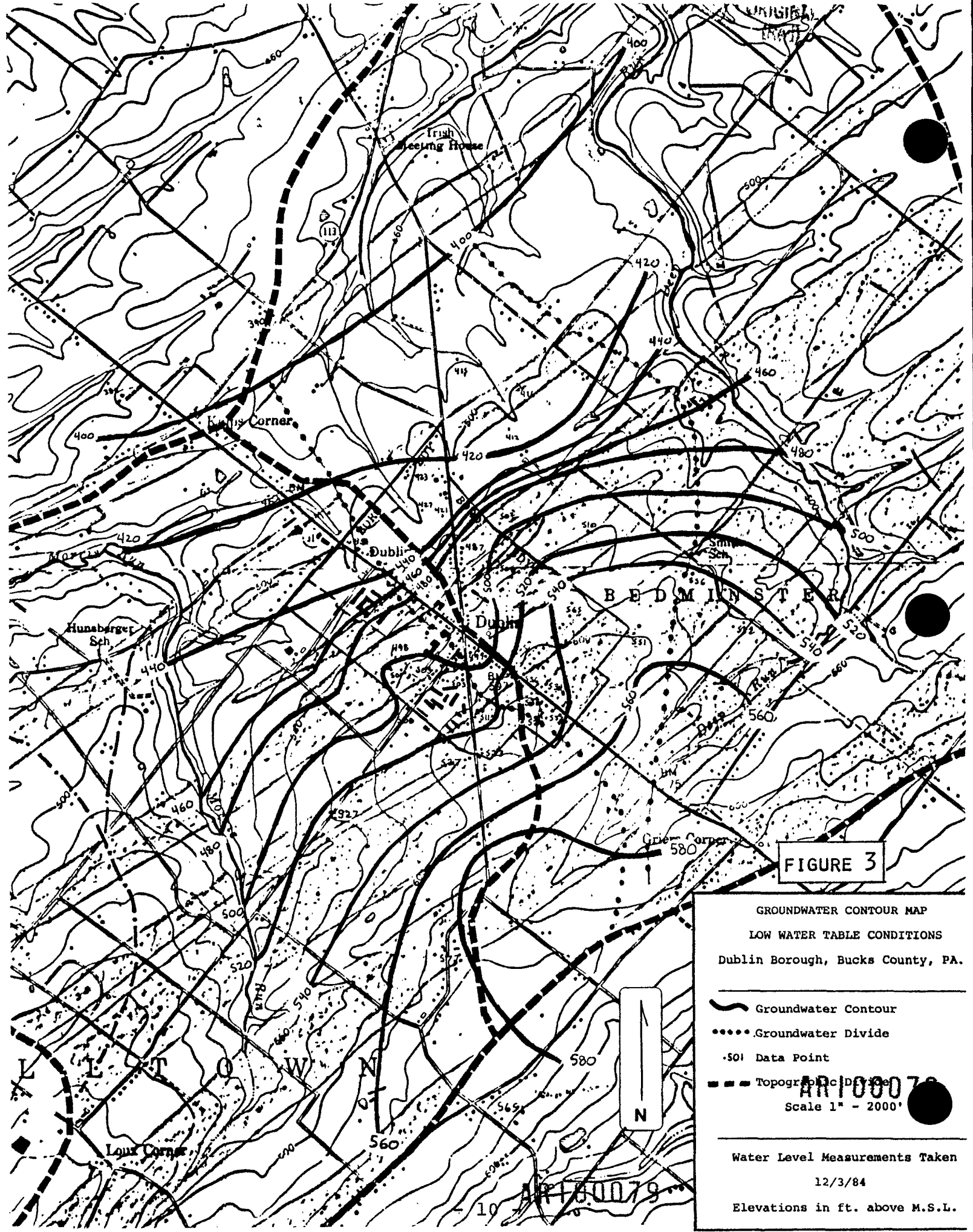


FIGURE 3

GROUNDWATER CONTOUR MAP
 LOW WATER TABLE CONDITIONS
 Dublin Borough, Bucks County, PA.

- Groundwater Contour
- Groundwater Divide
- Data Point
- Topographic Divide

Scale 1" = 2000'

Water Level Measurements Taken
 12/3/84
 Elevations in ft. above M.S.L.

cally connected to the respective halves of Dublin Borough.

Therefore, should Dublin Borough relocate a production well outside the Borough, as long as the well supplies only those consumers in the Borough that are located in the same watershed as the new well, the hydrologic budgets, and thus the available water, for each of the Townships remains the same. In effect, Dublin Borough would be taking no more water than it was already recovering from the respective basins; the only thing changing is the relative location of the consumption.

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GROUNDWATER FLUCTUATIONS

Dublin #1 Well

Both pumping and static water level measurements of the Dublin #1 well in 1984, indicate that substantial and predictable water level fluctuations occurred (Figure 4). Limited data in the beginning of the year shows that the well water level rose out of the December 1983 drought emergency in response to defoliation, precipitation and decreased consumption.

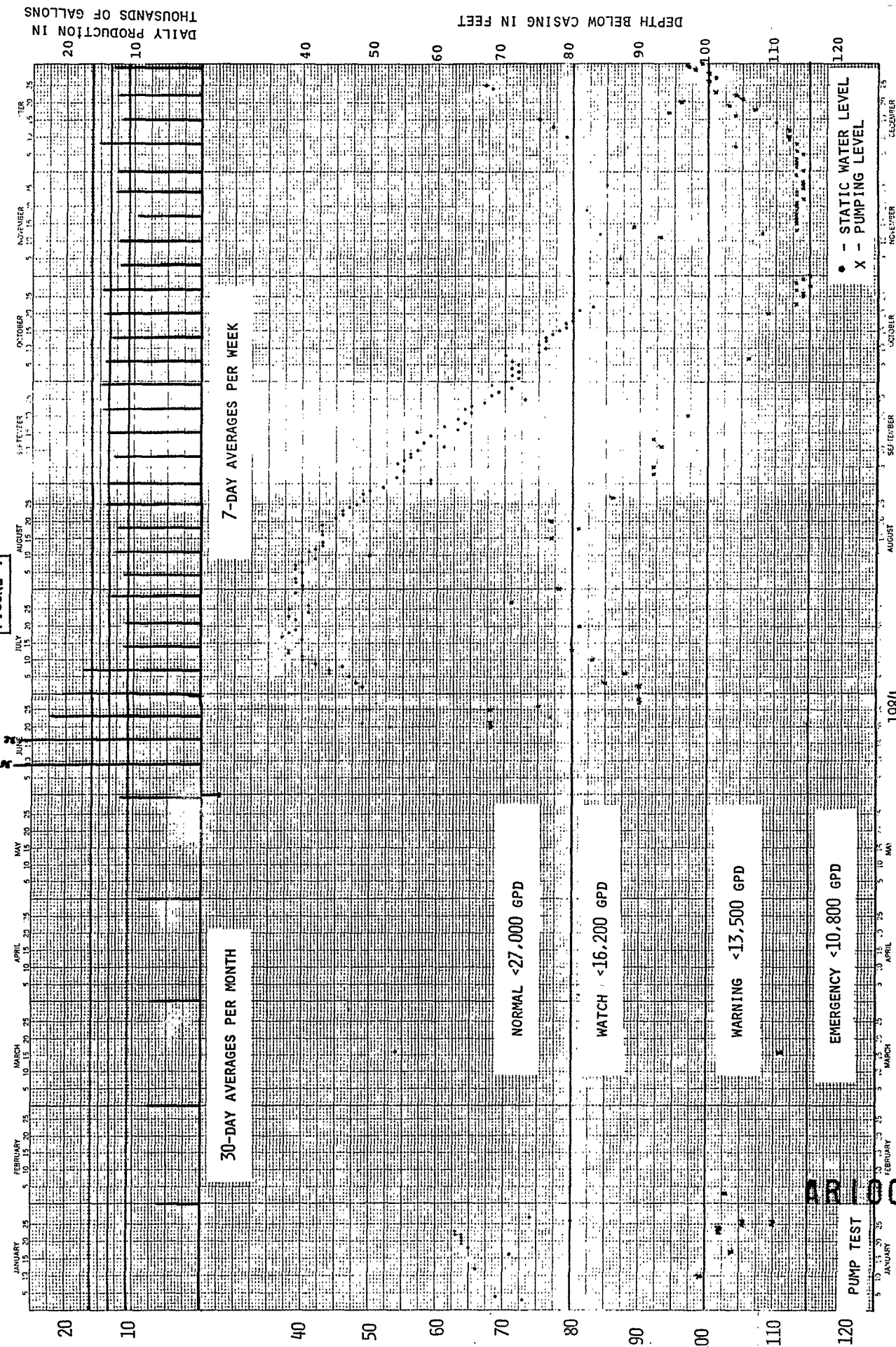
During the spring of 1984, no reliable data exists for conclusions to be made on the effects of lowered consumption and above average precipitation. The abnormally high consumption in June may have drawn water levels down from higher levels in May.

In June and July, water levels rose in response to decreasing water consumption and increasingly high precipitation rates. It appears that the maximum pumping level attainable during summer months when pumping approximately 13,000 gallons per day is approximately 77 feet below the surface.

From mid August to November, water levels declined consistently at a rate of 0.47 feet per day. Production remained fairly constant during this period and the decline is believed to have occurred from below average rainfall combined with the transpiration affects of plants. A slight and short duration recovery peak occurred within one week after a substantial rainfall at the end of September. It is, therefore, important to note that short

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FIGURE 4



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term rainfall, especially during summer months, may have very little affect on improving the long term water situation.

Water levels stabilized in November in response to defoliation and a brief reduction in consumption in mid November. Water levels rose through December into mid January as a result of moderate rainfall that could enter the aquifers without being intercepted by growing plants. This rise occurred at a rate of 0.67 feet per day.

Data indicates that from mid January to February, water levels begin decling at a rate of 0.4 feet per day in response to a lack of snowmelt and the frozen ground.

It is obvious that the Dublin #1 well water levels are affected significantly by total daily production, precipitation and plant transpiration. In addition, it is believed that the hourly pumping rates substantially affect pumping levels. By decreasing hourly pumping rates and increasing the length of time which the pump runs, it is believed that pumping levels could be significantly raised. The problem is that the long-term effect on surrounding wells will not change. Therefore, we recommend using static water levels as an indicator of drought conditions and reducing hourly pumping rates by half.

Figure 5 shows the excellent correlation of the 60 gallon per minute pumping level to static levels. Table 2 provided on the chart should be employed to define the static level which should be used. It is to the best interest of the Borough to use static

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DUBLIN WELL #1

RELATIONSHIP OF STATIC TO PUMPING LEVELS (1984 DATA)

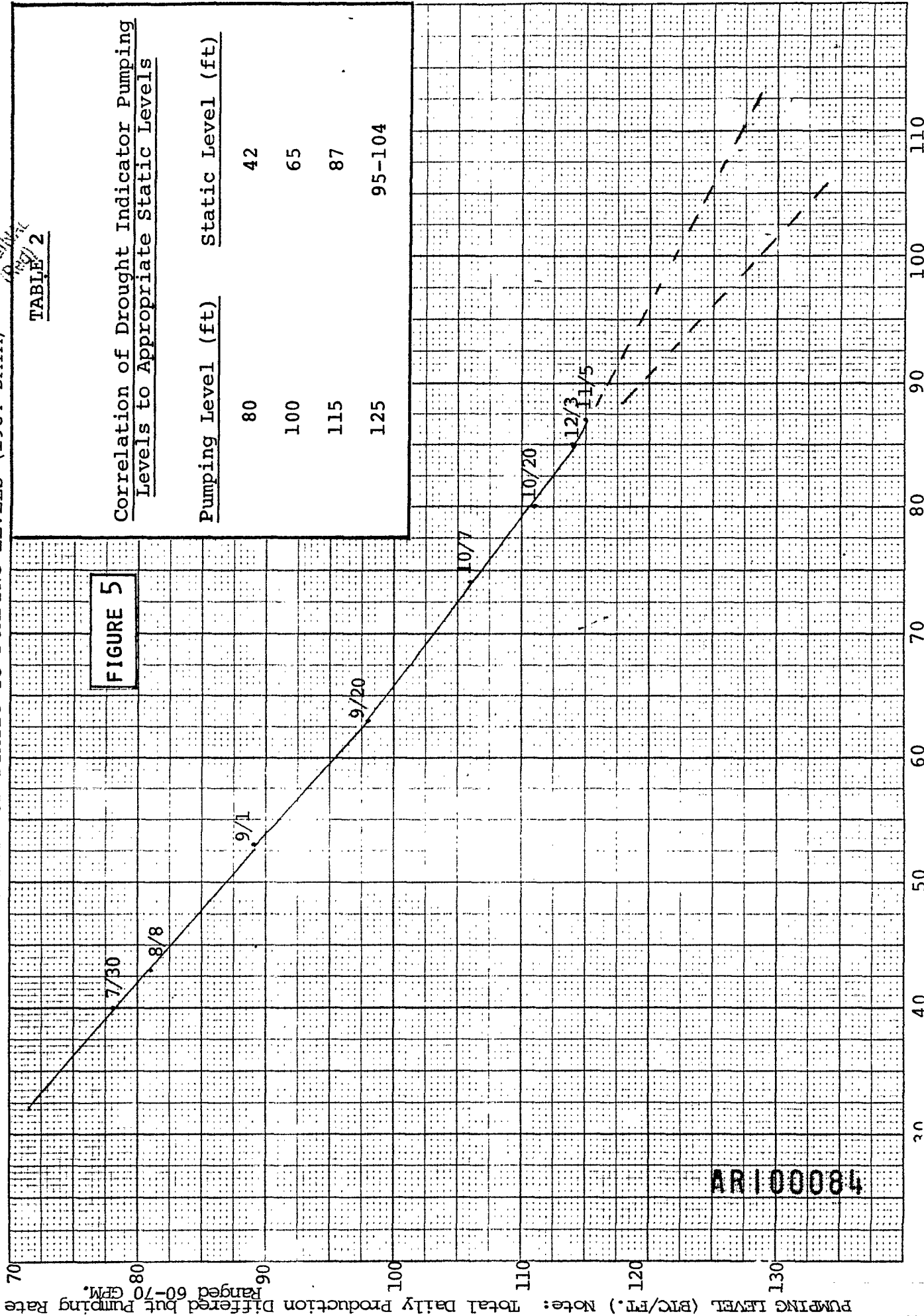


TABLE 2

Correlation of Drought Indicator Pumping Levels to Appropriate Static Levels

Pumping Level (ft)	Static Level (ft)
80	42
100	65
115	87
125	95-104

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levels and reduce the maximum pumping level to limit affecting nearby wells and decrease strain on the pump.

The water levels for the Dublin #2 well in 1984 reflect the trends seen in Well #1 and closely approximate the static water levels of Well #1 (Figure 6).

Regional Groundwater Fluctuations

A change in groundwater level map (Figure 7) for the period from June 19 to September 20, 1984, may depict areas of high stress on groundwater storage. Lowering water levels appear to be related to hilltop locations and limited aquifer storativity, in addition to high groundwater consumption.

The map indicates that the southern end of Dublin experienced the greatest dewatering effects around the Dublin #1 well and Woods Edge Apartments. Some additional drawdown may also have occurred at the other apartment complexes, but limited data was available in these areas. Evidence suggests that the pumping effects of the Stonebridge production well network may be affecting water levels in the northern edge of Dublin Borough.

Depth to Water Table

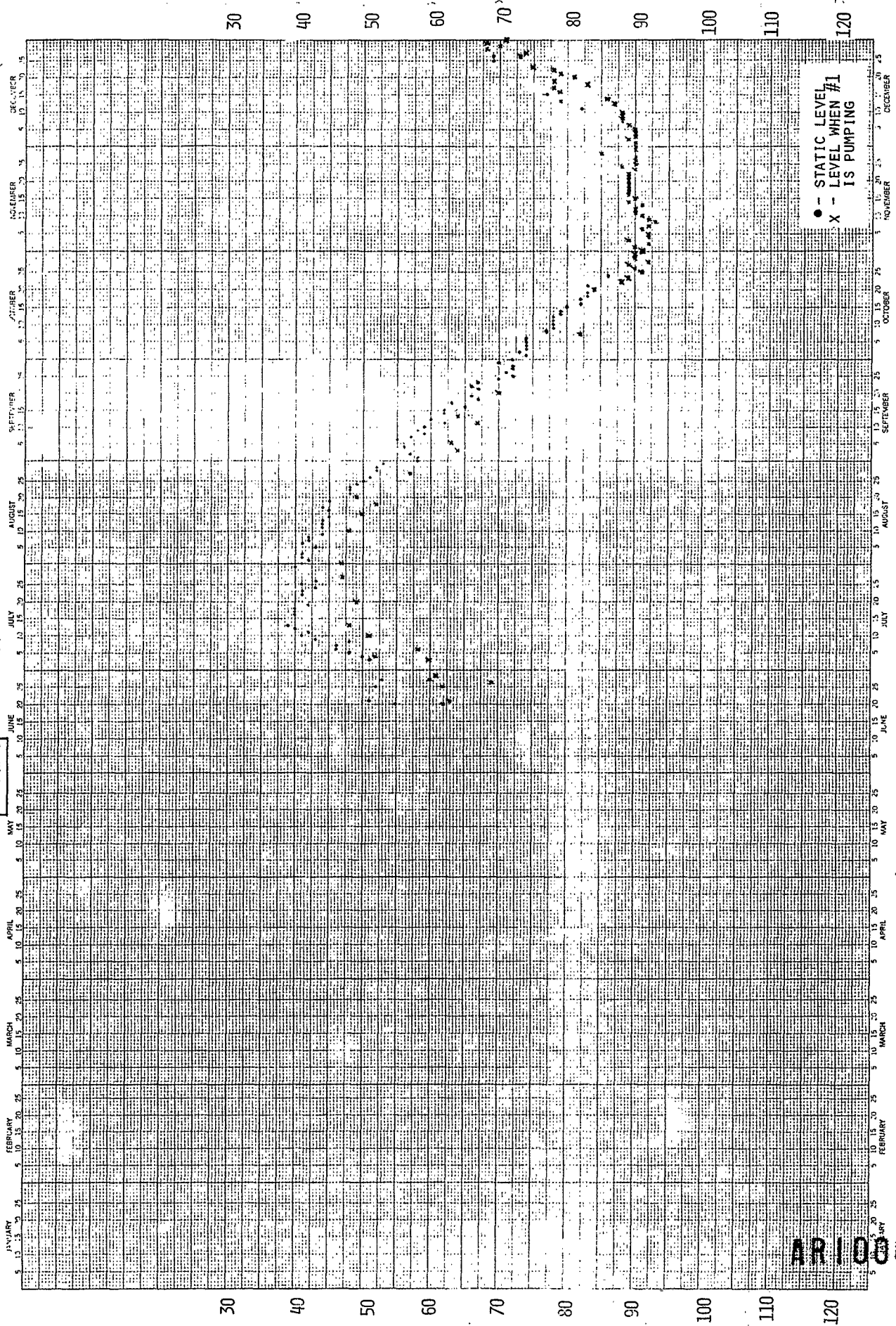
The distance from the surface to the water table may be affected by groundwater consumption. Other natural factors may also influence water levels. The ultimate concern is that water levels do not become lower than pump settings in any well.

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(Red)

DEPTH BELOW TOP OF CASING IN FEET

1984

FIGURE 6



WATER LEVELS DUBLIN #2 WELL

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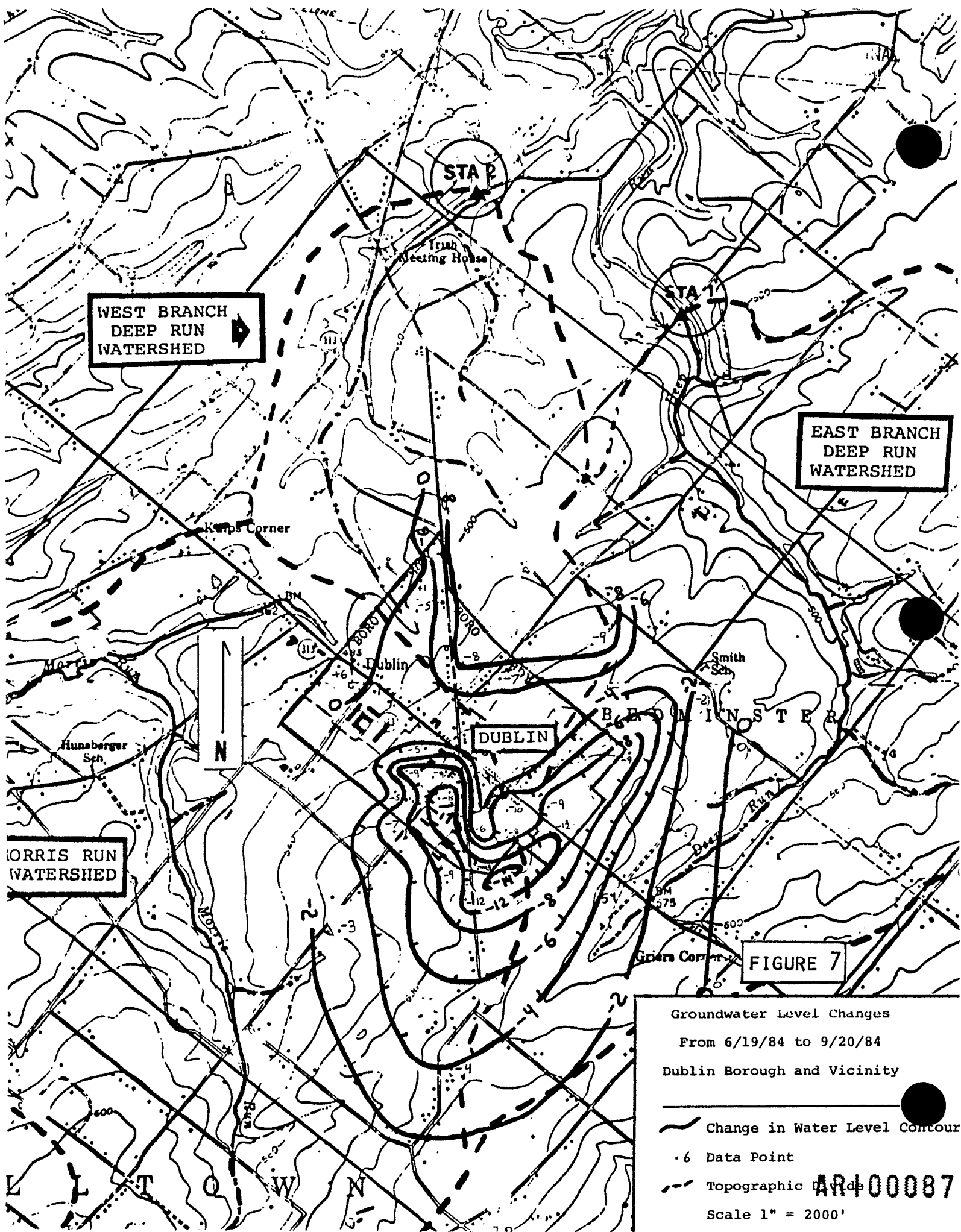


Figure 8 indicates the depth to groundwater on June 19, 1984, when the area had the highest yearly water levels recorded. Two zones exist centering around the southern and northern corners of the borough where high consumption is occurring.

Figure 9 depicts depths to groundwater on December 3, 1984, and shows substantially larger and deeper cones of depressions forming in response to decreased groundwater recharge.

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WEST BRANCH
DEEP RUN
WATERSHED

EAST BRANCH
DEEP RUN
WATERSHED

MORRIS RUN
WATERSHED

DUBLIN

FIGURE 8

DEPTH TO GROUNDWATER
Dublin Borough and Vicinity
June 19, 1984

- Depth to groundwater conto
- Depth to groundwater great than 60 ft.
- .78 Data point
- Topographic divide



Scale 1" = 2000'

ORIGINAL
(Red)

WEST BRANCH
DEEP RUN
WATERSHED

EAST BRANCH
DEEP RUN
WATERSHED

MORRIS RUN
WATERSHED

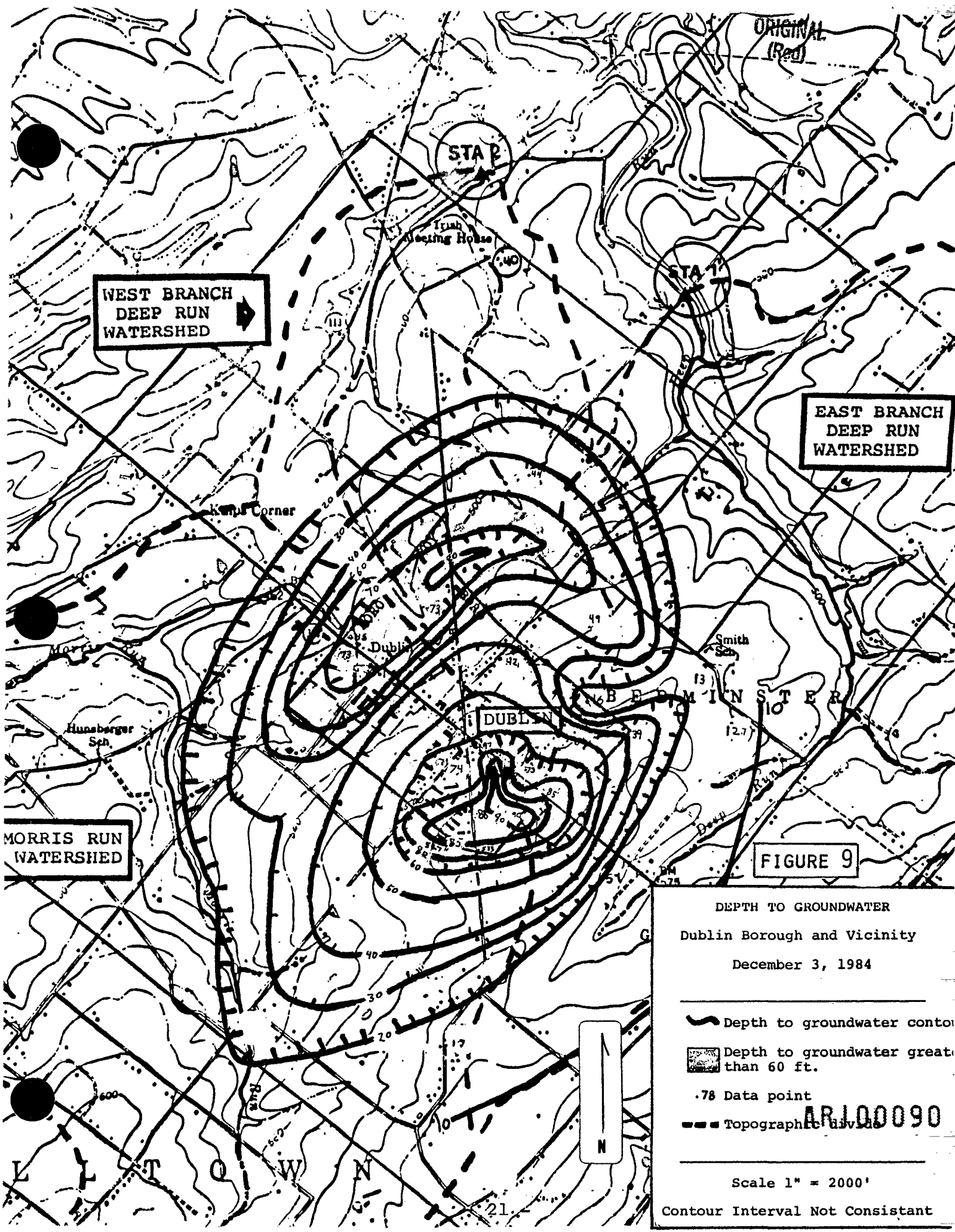
FIGURE 9

DEPTH TO GROUNDWATER
Dublin Borough and Vicinity
December 3, 1984

- Depth to groundwater contour
- Depth to groundwater greater than 60 ft.
- .78 Data point
- Topographic survey

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Scale 1" = 2000'
Contour Interval Not Consistent



SURFACE WATER FLUCTUATIONS

Total Stream Flows

No direct data exists on total stream flow for the Dublin area. Regional studies indicate that total runoff for a year removes 27 percent of the precipitation entering the basin. An additional 13 percent is removed by base flow which is groundwater seeping into the stream (R.E. Wright).

Generally, runoff rates are substantially higher during the months when plants are defoliated. Frozen ground also contributes to increasing runoff. Plant transpiration of water and evaporation remove approximately 60 percent of the total precipitation. Thus, summer stream flow runoff and base flow are substantially reduced.

Base Flow Rates

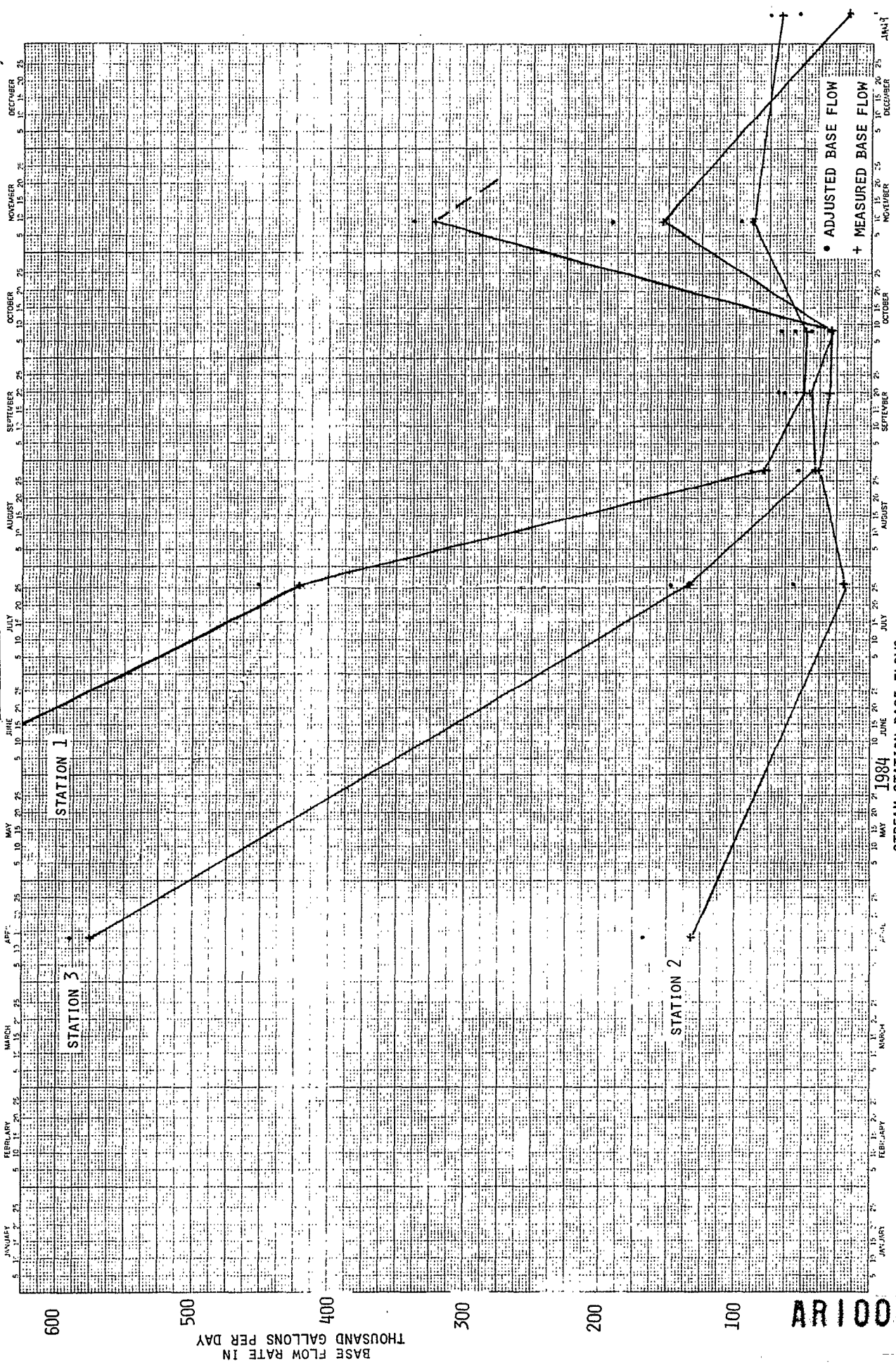
Base flow rate trends in 1984 for the three watersheds studied are depicted in Figure 10. During the spring period, base flows were substantially higher than in the late summer and fall as is the normal trend. Stream station #2 experienced a substantially lower base flow rate than the other stations. This is believed to have occurred as a result of the watershed having the greatest groundwater consumption density per square mile combined with its high stream gradient which would drain off water more quickly.

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10/10/84
(Reg)

FIGURE 10

125
+ MC



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STREAM STATION BASE FLOWS
DUBLIN WATERSHEDS

Base flow rates declined substantially through the summer in response to limited precipitation and the effects of plant transpiration. Rates began to increase at the end of October when defoliation occurred. Significantly low base flow rates were measured on January 9, 1985, as a result of a lack of precipitation and frozen ground.

Probability plots were developed from the base flow data to determine the average anticipated base flow rates for the period of study (Appendix IV). In order to determine the base flow rates which would have occurred without groundwater consumption, a corrected base flow rate was computed. This conservatively approximates groundwater recharge rates which are what the D.R.B.C. uses to compute the water budget for production wells. Appendix contains a compilation of the base flow information and Table 3. is a summary of the important base flow calculations.

TABLE 3

BASE FLOW CALCULATIONS FOR THE PERIOD FROMAPRIL 13, 1984, to JANUARY 9, 1985

Station	Drainage Area (mi ²)	Average Base Flow (gpd/mi ²)	Consumption within Watershed (gpd)	Consumption Density (gpd/mi ²)	Corrected Base Flow (gpd/mi ²)
1. West Branch Deep Run	3.47	81,221	30,390	8,758	89,979
2. East Branch Deep Run	1.44	31,020	54,278	37,693	68,712
3. Morris Run	4.86	109,227	67,806	13,952	123,179
AVERAGE	3.26	73,822	50,825	20,134	93,956

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largest long-term rate of water level recovery was 0.67 feet per day occurring in December. These rates remained fairly constant throughout the months indicated, as did the pumping rate of 60 gallons per minute, and daily consumption of approximately 13,000 gallons.

5. Static water levels of the Dublin #1 well can be used to determine the required drought phases. There is a linear relationship between static and pumping water levels under existing pumping conditions. Static water level drought indicator values presented in Table 2 should be used to determine drought conditions. This will allow for the disregard of pumping water levels so that hourly pumping rates can be reduced. Such a program should raise the pumping water level and also relieve substantial strain on the pump.
6. During even a normal year of precipitation, while pumping at approximately 13,000 gallons per day, it is believed that the Dublin #1 well could possibly enter drought emergency conditions again.
7. Significant dewatering of the aquifers in the Dublin area occurred during the late summer and fall periods of low recharge. The depth to water table maps included in this report indicate the areas of concern (Figures 8 & 9).
8. It is believed that the above average rainfall, which occurred in the area during the spring of 1984, allowed the aquifers to

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CONCLUSIONS

1. Three watersheds drain the Dublin study area. They are the East and West Branches of Deep Run, as well as Morris Run. The Deep Run and Morris Run basin divide is straddled by the Borough of Dublin. Morris Run is located predominantly in Hilltown Township while Deep Run is primarily in Bedminster Township.
2. The groundwater divide between Morris Run and Deep Run basins closely corresponds to the surface divide. During periods of low recharge, the East Branch of the Deep Run groundwater basin may expand into the West Branch of Deep Run, probably being an influence of Stonebridge pumping.
3. The Borough of Dublin generally straddles the hydrologic divide between Morris Run and Deep Run. Should any Borough well be located outside of the borough, as long as it is supplying water to the previous independent consumers in its respective watershed, the hydrologic budget for the entire Township in which the well is located should not change.
4. The Dublin #1 well briefly experienced its measured yearly shallowest pumping water level of 77 feet below the surface at the end of July. Its lowest measured pumping level of 114 feet occurred during most of November.

The largest long-term rate of water level drawdown was 0.47 feet per day and occurred during August, September and October.

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partially recover from the fall of 1983 drought. Even with the surplus of rainfall, the water levels in the Dublin area remained substantially lower than in the surrounding countryside. This indicates that recharge did not entirely meet demand. If there had not been the high amount of precipitation occurring this spring, large portions of the Dublin area may have experienced substantially larger water level declines.

9. Base flow measurements of the streams drawing from Dublin indicate that the West Branch of Deep Run is experiencing the largest effects from groundwater removal as its actual base flow rates are generally the lowest. The West Branch of Deep Run has the highest rate of consumption per square mile being 37,693 gallons per day per square mile (gpd/mi²). Morris Run has the lowest consumption rate of 13,952 gpd/mi².
10. The average base flow rate for the study area from April, 1984, to January, 1985, was 73,822 gpd/mi². Correcting for groundwater consumers, base flow for the period was 93,956 gpd/mi². This corrected base flow is a conservative estimation of the recharge rate to the groundwater system. With such precipitation extremes for the year, it is difficult to say whether these values represent normal base flow conditions.
11. The lowest base flow rates for the year occurred in October during the fall drought. The average actual base flow rate for this period was measured at 35,400 gpd/mi². The corrected average base flow was 55,566 gpd/mi². These rates closely approximate the 1

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10 year drought base flow rate of 53,000 gpd/mi² used in the hydrologic budget assessment of Well #1. During the period that base flow remained at these values, the water level in the Dublin #1 well declined at a rate of .47 feet per day. Thus, in a 1 in 10 year drought, where the yearly average base flow or recharge rate is estimated to be 53,000 gpd/mi², it may be expected that the Dublin #1 well would decline on a yearly average at .47 feet per day for the year or 171.55'.

12. The existing monitoring program, soon to be improved by a continuous recorder, appears adequate in monitoring the surface and groundwater conditions in the Dublin area. Stonebridge well monitoring data is collected by the developer for submittal to the D.R.B.C. and is available for review.

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RECOMMENDATIONS

1. Because of the relatively higher base flow rates in the Morris Run watershed and the hydrologic setting of the basin, it is recommended that the Borough of Dublin continue to develop a municipal production well in the Morris Run basin. Hilltown Township should understand that the installation of such a well will not affect the overall hydrologic budget for this basin. This is provided that the water obtained replaces the independent groundwater consumers located in the Morris Run watershed. What is being done is centralizing and relocating the consumption further into the center of the basin where better recharge can occur.
2. The Lamelza #1 well is away from the regions of excessive water-table drawdown observed in the Borough on December 3, 1984. Thus, the site should continue to be explored for use as a supplemental well for the existing system.
3. Observations of the Dublin #1 well during 1984 indicated maximum water level decline and recovery rates of .47 and .67 feet per day. These values should be used for predicting worst and best case water level trends.
4. The D.R.B.C. should be approached to obtain permission to use static water levels from the Dublin #1 well instead of pumping levels for determining drought conditions. The hourly pumping rate of the well could then be reduced to decrease pumping drawdown and ease motor strain.

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5. Locking caps should be placed on all borough wells.
6. Any recycling or retaining of waste or runoff water should be considered; such spray irrigation of sewage treatment effluent onto the hilltop locations or surface water retention basins. Groundwater injection of surface water would require a permit and extensive purification prior to injection.
- 7.. An inventory of all water well depths and pump settings in and surrounding the borough would be performed and the information plotted onto a large scale base map. Depth to groundwater overlay maps could be constructed from measurements made during critical periods and compared with pump setting depths to determine which wells may be affected by a drought.

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REFERENCES

International Exploration, Inc. (INTEX), 1984, A Water Resources Study of the Dublin Area, Pennsylvania, 44 p., unpub.

Wright, R.E. & Associates, Inc., Special Groundwater Study of the Middle Delaware River Basin; for the Delaware River Basin Commission.

ORIGINAL
(Red)

APPENDIX I

MONITOR WELL DATA

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MONTHLY DROUGHT EMERGENCY

MEASUREMENTS - DUBLIN, PA.

DECEMBER 3, 1984

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 11/5/84
① Landis	615	84.15/530.85	530	700	+ 3.20
② Fray (Hosiery)	618	84.05/533.95	145	600	+ 2.33
③ Coleflesh	622	85.50/536.50	580	500	+ 2.20
④ Dublin #1	615	113.45P/501.55	350	0	-26.35
⑤ Dublin #2	615	89.55/525.45	290	75	- 0.07
⑥ Hallman	610	73.50/536.50	250	450	+ 5.70
7 Osterman	590	93.00/497.00	200	900	+ 0.35
8 P. Meyers	545	59.50/485.50	225	2,100	- 4.03
⑨ Lamellza	590	38.50/551.50	370	2,400	+ 1.02
⑩ Firehouse	500	73.25/426.75	220	4,000	- 1.80
⑪ M. Detweiler	580	74.15/505.85	355	1,200	+ 0.85
12 Nester	575	71.40/503.60	310	1,500	- 0.20
⑬ Shiel	582	81.55/500.45	180	1,750	+ 0.70
⑭ Stever	570	42.30/527.70	150	3,400	+ 1.10
15 C. Meyers	560	59.00/501.00	155	2,000	- 3.29
16 G. Moyer	555	56.60/498.40	165	2,100	- 3.64
17 Hagar	530	42.10/487.90	470	2,750	+ 4.90
18 Dublin Mews #2	505	77.80/427.20	310	4,000	- 0.78
⑰ Boehret	550	43.25/506.75	310	2,100	- 0.15
⑱ Swartz #1	618	84.50/533.50	460	900	+ 2.60
⑲ Swartz #2	618	60.10/557.90	520	925	+ 1.40
⑳ Miller	610	82.10/527.90	185	1,300	+ 2.65
23 Phy	610	NM	NA	1,350	--
24 Rissi	630	52.10/577.90	210	3,900	+ 3.57

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MONTHLY MEASUREMENTS - DUBLIN, PA.

DECEMBER 3, 1984

ORIGINAL
(Red)

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 11/5/84
25 Nicoletti	560	49.60/510.40	100	3,400	- 0.50
26 J. Meyers	570	13.50/556.50	230	3,900	+ 0.35
27 Graybill	565	12.70/552.30	200	4,100	+ 0.75
28 Webb	570	ART	50	4,400	NA
29 Ott	570	ART	NA	4,200	NA
30 Ragusa	625	10.30/614.70	NA	4,500	+ 1.85
31 Philipps	620	16.90/603.10	NA	2,700	+ 1.85
32 #1612	640	74.60/565.40	755	6,500	+22.65
33 Haines	520	ART	65**	5,700	NA
34 Painter	420	NM	NA	7,300	NA
35 Mosser*	460	NM	32	7,800	NA
36 Rhines	440	50.20/389.80	NA	8,800	- 0.20
37 Clemmer	460	69.50/390.50	NA	8,100	- 0.70
38 Keifer	440	>150/<290	165**	10,000	63.70
39 Kringe**	430	NA	265	10,300	NA
40 Kringe(Farm)**	460	NA	230	9,900	NA
41 Luby Stone Bridge "A"	500		NA	6,200	
(42) Otts	600	88.15/511.85	NA	700	+ 1.52
43 Dublin News #1	500		NA	4,600	
44 Stonebridge Well #4	490	77.6/412.4	NA	4,800	- 5.4
45 Leatherman S.B. Well "E"	530	27.3/502.7	NA	3,400	- 0.7
46 Reiff S.B. Well "D"	505	83.3/421.7	NA	3,700	- 0.4
47 Smith S.B. Well "C"	480	67.2/412.8	NA	5,000	- 2.1
48 Leatherman S.B. Well "B"	480	11.3/468.7	NA	6,800	+ 3.7

AR100104

1 THLY MEASUREMENTS - DUBLIN, PA

DECEMBER 3, 1984

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 11/5/84
49 Stonebridge Well #10	460	44.5/415.5	NA	6,200	- 3.3
50 S.B. Well #1*	490	73.3/416.7	NA	5,800	-1.0
51 Hoffman	480	NM	NA	5,900	NA
52 Bishop	505	NM	125	4,500	NA
53 Phillips	540	X	NA	5,800	NA
54 Dublin Sewage Plant	530	8.10/521.90	NA	9,300	NA
55 Tyson	490	26.50/	NA	6,600	- 1.70
(56) Rosenelli	500	7300/427.00	250	4,416	+ 0.10
57 Dumire	460	NM	NA	5,424	NA
58 Dublin #3	582	16.10/565.90	500	2,200	NA

(1) Key Monitoring Well

* Dug well - not currently used.

** Not actually measured - information given by Landowner.

NA Not available.

+ Measurements made by Stonebridge.

NM Not Measured.

P Pumping

X Neighboring well (Dumire, #57) is being measured in place of this well.

ART Artesian Well

AR100105

WEEKLY DROUGHT EMERGENCY

ORIGINAL
(Red)

WATER LEVEL MEASUREMENTS OF KEY WELLS

DUBLIN, PA. - NOVEMBER 26, 1984

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 11/19/84
① Landis	615	83.90/531.10	530	700	- 2.75
② Fray (Hosiery)	618	85.65/532.35	145	600	- 2.85
③ Coleflesh	622	86.10/535.90	580	500	- 0.35
④ Dublin #1	615	85.10/529.90	350	0	- 2.90
⑤ Dublin #2	615	87.00/528.00	290	75	- 2.50
⑥ Hallman	610	75.10/534.90	250	450	- 0.95
7 Osterman	590		200	900	
8 P. Meyers	545		225	2,100	
⑨ Lamellza	590	47.40/542.60	370	2,400	-10.75
⑩ Firehouse	500	73.30/426.70	220	4,000	- 0.10
⑪ M. Detweiler	580	71.35/508.65	355	1,200	+13.40
12 Nester	575		310	1,500	
⑬ Shiel	582	81.35/500.65	180	1,750	+ 0.65
⑭ Stever	570	42.80/527.20	150	3,400	- 0.60
15 C. Meyers	560		155	2,000	
16 G. Moyer	555		165	2,100	
17 Hagar	530		470	2,750	
18 Dublin Mews #2	505		310	4,000	
⑰ Boehret	550	44.65/505.35	310	2,100	+ 2.15
⑱ Swartz #1	618	85.10/532.90	460	900	- 1.20
⑲ Swartz #2	618	60.50/557.50	520	925	- 0.60
⑳ Miller	610	83.00/527.00	185	1,300	- 1.05
23 Phy	610		NA	1,350	
24 Rissi	630		210	3,900	

AR100106

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 11/19/84
29 Nicoletti	560		100	3,400	
26 J. Meyers	570		230	3,900	
27 Graybill	565		200	4,100	
28 Webb	570		50	4,400	
29 Ott	570		NA	4,200	
30 Ragusa	625		NA	4,500	
31 Philipps	620		NA	2,700	
32 #1612	640		755	6,500	
33 Haines	520		65**	5,700	
34 Painter	420		NA	7,300	
35 Mosser*	460		32	7,800	
36 Rhines	440		NA	8,800	
37 Clemmer	460		NA	8,100	
38 Keifer	440		165**	10,000	
39 Kringe**	430		265	10,300	
40 Kringe(Farm)**	460		230	9,900	
41 Luby Stone Bridge "A"	500		NA	6,200	
④2 Otts	600	89.30/510.70	NA	700	- 2.80
43 Dublin Mews #1	500		NA	4,600	
44 Stonebridge Well #4	490		NA	4,800	
45 Leatherman S.B. Well "E"	530		NA	3,400	
46 Reiff S.B. Well "D"†	505		NA	3,700	
47 Smith S.B. Well "C"†	480		NA	5,000	
48 Leatherman S.B. Well "B"†	480		NA	6,800	

AR100107

KEY WELLS - 11/26/84

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 11/19/84
Stonebridge					
49 Well #10	460		NA	6,200	
50 S.B. Well #1 ⁺	490		NA	5,800	
51 Hoffman	480		NA	5,900	
52 Bishop	505		125	4,500	
53 Phillips	540		NA	5,800	
Dublin					
54 Sewage Plant	530		NA	9,300	
55 Tyson	490		NA	6,600	
(56) Rosenelli	500	74.85/425.15	250	4,416	+ 8.15
57 Dumire	460		NA	5,424	
58 Dublin #3	582	17.15/564.85	500	2,200	

(1) Key Monitoring Well

* Dug well - not currently used.

** Not actually measured - information given by Landowner.

NA Not available.

+ Measurements made by Stonebridge.

NM Not Measured.

P Pumping

X Neighboring well (Dumire, #57) is being measured in place of this well

ART Artesian Well

AR100108

WEEKLY DROUGHT EMERGENCY

ORIGINAL
(Red)

WATER LEVEL MEASUREMENTS OF KEY WELLS

DUBLIN, PA. - 11/19/84

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 11/12/84
① Landis	615	81.15/533.85	530	700	+2.65
② Fray (Hosiery)	618	82.80/535.20	145	600	+1.30
③ Coleflesh	622	85.75/536.25	580	500	+0.35
④ Dublin #1	615	82.20/532.80	350	0	+2.35
⑤ Dublin #2	615	84.50/530.50	290	75	+2.30
⑥ Hallman	610	74.15/535.85	250	450	+0.50
7 Osterman	590		200	900	
8 P. Meyers	545		225	2,100	
⑨ Lamellza	590	36.65/553.35	370	2,400	+0.80
⑩ Firehouse	500	73.20/426.80	220	4,000	-0.60
⑪ M. Detweiler	580	84.75/495.25	355	1,200	-9.95
12 Nester	575		310	1,500	
⑬ Shiel	582	82.00/500.00	180	1,750	+0.60
⑭ Stever	570	42.20/527.80	150	3,400	-0.40
15 C. Meyers	560		155	2,000	
16 G. Moyer	555		165	2,100	
17 Hagar	530		470	2,750	
18 Dublin Maws #2	505		310	4,000	
⑰ Boehret	550	46.80/503.20	310	2,100	-4.30
⑱ Swartz #1	618	83.90/534.10	460	900	+1.40
⑲ Swartz #2	618	59.90/558.10	520	925	-1.50
⑳ Miller	610	81.95/528.05	185	1,300	+1.15
23 Phy	610		NA	1,350	
24 Rissi	630		210	3,900	

AR100109

KEY WELLS - 11/19/84

ORIGINAL
(Red)

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 11/12/84
25 Nicoletti	560	48.80/511.20	100	3,400	-1.08
26 J. Meyers	570	14.05/555.95	230	3,900	+0.67
27 Graybill	565	13.60/551.40	200	4,100	-0.43
28 Webb	570		50	4,400	
29 Ott	570		NA	4,200	
30 Ragusa	625		NA	4,500	
31 Philipps	620		NA	2,700	
32 #1612	640		755	6,500	
33 Haines	520		65**	5,700	
34 Painter	420		NA	7,300	
35 Mosser*	460		32	7,800	
36 Rhines	440		NA	8,800	
37 Clemmer	460		NA	8,100	
38 Keifer	440		165**	10,000	
39 Kringe**	430		265	10,300	
40 Kringe(Farm)**	460		230	9,900	
41 Luby Stone Bridge "A"	500		NA	6,200	
(42) Otts	600	86.50/513.50	NA	700	+3.35
43 Dublin Mews #1	500		NA	4,600	
44 Stonebridge Well #4	490		NA	4,800	
45 Leatherman S.B. Well "E"	530		NA	3,400	
46 Reiff S.B. Well "D"†	505		NA	3,700	
47 Smith S.B. Well "C"†	480		NA	5,000	
48 Leatherman S.B. Well "B"†	480		NA	6,800	

AR100110

KEY WELLS - 11/19/84

ORIGINAL
(Red)

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 11, 1984
49 Stonebridge Well #10	460		NA	6,200	
50 S.B. Well #1 ⁺	490		NA	5,800	
51 Hoffman	480		NA	5,900	
52 Bishop	505		125	4,500	
53 Phillips	540		NA	5,800	
54 Dublin Sewage Plant	530		NA	9,300	
55 Tyson	490		NA	6,600	
(56) Rosenelli	500	83.00/417.00	250	4,416	-9.85
57 Dumire	460		NA	5,424	
58 Dublin #3	582		500	2,200	

① Key Monitoring Well

* Dug well - not currently used.

** Not actually measured - information given by Landowner.

NA Not available.

+ Measurements made by Stonebridge.

NM Not Measured.

P Pumping

X Neighboring well (Dumire, #57) is being measured in place of this well

ART Artesian Well

AR100111

WEEKLY DROUGHT EMERGENCY
MEASUREMENTS OF KEY WELLS
DUBLIN, PA. - 11/12/84

ORIGINAL
(Red)

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 11/5/84
① Landis	615	83.80/531.20	530	700	+3.55
② Fray (Hosiery)	618	84.10/533.90	145	600	+2.28
③ Coleflesh	622	86.10/535.90	580	500	+1.60
④ Dublin #1	615	84.55/530.45	350	0	+2.55
⑤ Dublin #2	615	86.80/528.20	290	75	+2.05
⑥ Hallman	610	74.65/535.35	250	450	+4.55
7 Osterman	590		200	900	
8 P. Meyers	545		225	2,100	
⑨ Lamellza	590	37.45/552.55	370	2,400	+2.07
⑩ Firehouse	500	72.60/427.40	220	4,000	-1.15
⑪ M. Detweiler	580	74.80/505.20	355	1,200	+2.40
12 Nester	575		310	1,500	
⑬ Shiel	582	82.60/499.40	180	1,750	-0.35
⑭ Stever	570	41.80/528.20	150	3,400	+1.60
15 C. Meyers	560		155	2,000	
16 G. Moyer	555		165	2,100	
17 Hagar	530		470	2,750	
18 Dublin Mews #2	505		310	4,000	
⑰ Boehret	550	42.50/507.50	310	2,100	+0.60
⑲ Swartz #1	618	85.30/532.70	460	900	+1.80
⑳ Swartz #2	618	58.40/559.60	520	925	+3.10
㉑ Miller	610	83.10/526.90	185	1,300	+1.65
23 Phy	610		NA	1,350	
24 Rissi	630		210	3,900	

AR100112

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 11/5/84
△ Nicoletti	560	47.72/512.28	100	3,400	+1.38
△ J. Meyers	570	14.72/555.28	230	3,900	-0.87
△ Graybill	565	13.17/551.83	200	4,100	+0.28
28 Webb	570		50	4,400	
29 Ott	570		NA	4,200	
30 Ragusa	625		NA	4,500	
31 Philipps	620		NA	2,700	
32 #1612	640		755	6,500	
33 Haines	520		65**	5,700	
34 Painter	420		NA	7,300	
35 Mosser*	460		32	7,800	
36 Rhines	440		NA	8,800	
37 Clemmer	460		NA	8,100	
38 Keifer	440		165**	10,000	
39 Kringe**	430		265	10,300	
40 Kringe(Farm)**	460		230	9,900	
41 Luby Stone Bridge "A"	500		NA	6,200	
④2 Otts	600	89.85/510.15	NA	700	-0.18
43 Dublin Mews #1	500		NA	4,600	
44 Stonebridge Well #4	490		NA	4,800	
45 Leatherman S.B. Well "E"	530		NA	3,400	
46 Reiff S.B. Well "D"†	505		NA	3,700	
47 Smith S.B. Well "C"†	480		NA	5,000	
48 Leatherman S.B. Well "B"†	480		NA	6,800	

AR100113

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 11/5/84
49 Stonebridge Well #10	460		NA	6,200	
50 S.B. Well #1 ⁺	490		NA	5,800	
51 Hoffman	480		NA	5,900	
52 Bishop	505		125	4,500	
53 Phillips	540	X	NA	5,800	
54 Dublin Sewage Plant	530		NA	9,300	
55 Tyson	490		NA	6,600	
⑤⑥ Rosenelli	500	73.15/426.85	250	4,416	-0.05
57 Dumire	460		NA	5,424	
58 Stauffer	587	12.27+4.75/569.98	75	1,800	+2.62
59 Hetherington	595	10.75/584.25	NA	1,900	NA
60 Lamellza #2	570	20.00/550.00	--	3,000	NA
61 Green	--		--	--	

① Key Monitoring Well

* Dug well - not currently used.

** Not actually measured - information given by Landowner.

NA Not available.

+ Measurements made by Stonebridge.

NM Not Measured.

P Pumping

X Neighboring well (Dumire, #57) is being measured in place of this well.

ART Artesian Well

 Observation wells for pump test.

AR100114

WEEKLY DROUGHT EMERGENCY

MEASUREMENTS - DUBLIN, PA.

11/5/84

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 10/29/84
① Landis	615	87.35/527.65	530	700	- 2.37
② Fray (Hosiery)	618	86.38/531.62	145	600	- 0.43
③ Coleflesh	622	87.70/534.30	580	500	+ 0.15
④ Dublin #1	615	87.10/527.90	350	0	- 1.30
⑤ Dublin #2	615	88.85/526.15	290	75	- 1.15
⑥ Hallman	610	79.20/530.80	250	450	- 3.09
7 Osterman	590	93.35/496.65	200	900	NA
8 P. Meyers	545	55.47/489.53	225	2,100	NA
⑨ Lamellza	590	39.52/550.48	370	2,400	- 0.57
⑩ Firehouse	500	71.45/428.55	220	4,000	- 1.49
⑪ M. Detweiler	580	75.00/505.00	355	1,200	- 1.00
12 Nester	575	71.20/503.80	310	1,500	NA
⑬ Shiel (Wiles)	582	82.25/499.75	180	1,750	- .79
⑭ Stever	570	43.40/526.60	150	3,400	+ 1.1
15 C. Meyers	560	55.71/504.29	155	2,000	NA
16 G. Moyer	555	52.96/502.04	165	2,100	NA
17 Hagar	530	47.00/483.00	470	2,750	NA
18 Dublin Mews #2	505	77.02/427.98	310	4,000	NA
⑰ Boehret	550	43.10/506.90	310	2,100	- 1.93
⑱ Swartz #1	618	87.10/530.90	460	900	- 1.05
⑲ Swartz #2	618	61.50/556.50	520	925	+ 0.85
⑳ Miller	610	84.75/525.25	185	1,300	- 0.85
23 Phy	610	64.60/545.40	NA	1,350	NA
24 Rissi	630	55.67/574.33	210	3,900	NA

AR100115

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 10/22/84
49 Stonebridge Well #10	460	—	NA	6,200	—
50 S.B. Well #1 ⁺	490	"	NA	5,800	"
51 Hoffman	480	"	NA	5,900	"
52 Bishop	505	"	125	4,500	"
53 Phillips	540	"	NA	5,800	"
54 Dublin Sewage Plant	530	"	NA	9,300	"
55 Tyson	490	"	NA	6,600	"
(56) Rosenelli	500	74.57/425.43	250	4,416	-0.40
57 Dumire	460	—	NA	5,424	NA
58 Stauffer	587	22.72/564.28	75	2,0000	"

STREAM FLOW MEASUREMENTS:

	<u>GAUGE HT. (FEET)</u>	<u>TOTAL FLOW</u>	<u>BASE FLOW</u>
STATION 1	13.2	NM	NM
STATION 2	6.6	NM	NM
STATION 3	9.9	NM	NM

(1) Key Monitoring Well

* Dug well - not currently used.

** Not actually measured - information given by Landowner.

NA Not available.

+ Measurements made by Stonebridge.

NM Not Measured.

P Pumping

X Neighboring well (Dumire, #57) is being measured in place of this well.

ART Artesian Well

AR100116

WE _Y DROUGHT EMERGENCY MEASUREMEI
DUBLIN BOROUGH, PA. - 10/29/84

INDUSTRIAL
(Red)

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 10/22/84
25 Nicoletti	560	—	100	3,400	—
26 J. Meyers	570	"	230	3,900	"
27 Graybill	565	"	200	4,100	"
28 Webb	570	"	50	4,400	"
29 Ott	570	"	NA	4,200	"
30 Ragusa	625	"	NA	4,500	"
31 Philipps	620	"	NA	2,700	"
32 #1612	640	"	755	6,500	"
33 Haines	520	"	65**	5,700	"
34 Painter	420	"	NA	7,300	"
35 Mosser*	460	"	32	7,800	"
36 Rhines	440	"	NA	8,800	"
37 Clemmer	460	"	NA	8,100	"
38 Keifer	440	"	165**	10,000	"
39 Kringe**	430	"	265	10,300	"
40 Kringe(Farm)**	460	"	230	9,900	"
41 Luby Stone Bridge "A"	500	"	NA	6,200	"
(42) Otts	600	88.55/511.45	NA	700	- 1.77
43 Dublin Mews #1	500	—	NA	4,600	—
44 Stonebridge Well #2 Pumping	490	"	NA	4,800	"
45 Leatherman S.B. Well "E"	530	"	NA	3,400	"
46 Reiff S.B. Well "D"†	505	"	NA	3,700	"
47 Smith S.B. Well "C"†	480	"	NA	5,000	"
48 Leatherman S.B. Well "B"†	480	"	NA	6,800	"

AR100117

WEEKLY DROUGHT EMERGENCY MEASUREMENTS

DUBLIN BOROUGH, PA. - 10/29/84

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 10/22/84
① Landis	615	84.98/530.02	530	700	- 3.31
② Fray (Hosiery)	618	85.95/532.05	145	600	- 3.09
③ Coleflesh	622	87.85/534.15	580	500	- 3.72
④ Dublin #1	615	85.30/529.20	350	0	- 3.50
⑤ Dublin #2	615	87.70/527.30	290	75	- 3.20
⑥ Hallman	610	76.11/533.89	250	450	- 3.32
7 Osterman	590	--	200	900	--
8 P. Meyers	545	--	225	2,100	--
⑨ Lamellza	590	38.95/551.05	370	2,400	- 1.80
⑩ Firehouse	500	69.96/430.05	220	4,000	- 1.40
⑪ M. Detweiler	580	74.00/506.00	355	1,200	- 2.98
12 Nester	575	--	310	1,500	--
⑬ Shiel	582	81.46/500.54	180	1,750	- 2.39
⑭ Stever	570	44.50/525.50	150	3,400	- 0.45
15 C. Meyers	560	--	155	2,000	--
16 G. Moyer	555	--	165	2,100	--
17 Hagar	530	--	470	2,750	--
18 Dublin Mews #2	505	--	310	4,000	--
⑰ Boehret	550	41.17/508.83	310	2,100	- 2.55
⑱ Swartz #1	618	86.05/531.95	460	900	- 2.47
⑲ Swartz #2	618	62.35/555.68	520	925	- 0.48
⑳ Miller	610	83.90/526.1	185	1,300	- 2.60
23 Phy	610	--	NA	1,350	--
24 Rissi	630	--	210	3,900	--

AR100118

WEEKLY DROUGHT EMERGENCY
MEASUREMENTS - DUBLIN, PA.

ADDITIONAL
Red

Well	Surface Elevation M.S.L.	11/5/84 Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 10/29/84
25 Nicoletti	560	49.10/510.90	100	3,400	NA
26 J. Meyers	570	13.85/556.15	230	3,900	NA
27 Graybill	565	13.45/551.55	200	4,100	NA
28 Webb	570	ART	50	4,400	NA
29 Ott	570	ART	NA	4,200	NA
30 Ragusa	625	12.15/612.85	NA	4,500	NA
31 Philipps	620	18.75/601.25	NA	2,700	NA
32 #1612	640	97.25/542.75	755	6,500	NA
33 Haines	520	ART	65**	5,700	NA
34 Painter	420	NM	NA	7,300	NA
35 Mosser*	460	16.20/443.80	32	7,800	NA
36 Rhines	440	50.00/390.00	NA	8,800	NA
37 Clemmer	460	68.80/391.20	NA	8,100	NA
38 Keifer	440	86.30/353.70	165**	10,000	NA
39 Kringe**	430	NA	265	10,300	NA
40 Kringe(Farm)**	460	NA	230	9,900	NA
41 Luby Stone Bridge "A"	500	68.10/431.90	NA	6,200	NA
(42) Otts	600	89.67/510.33	NA	700	-1.12
43 Dublin Mews #1	500	81.00/419.00	NA	4,600	NA
44 Stonebridge Well #4	490	72.20/417.80	NA	4,800	NA
45 Leatherman S.B. Well "E"	530	26.60/503.40	NA	3,400	NA
46 Reiff S.B. Well "D"†	505	82.90/422.10	NA	3,700	NA
47 Smith S.B. Well "C"†	480	65.10/414.90	NA	5,000	AR100119
48 Leatherman S.B. Well "B"†	480	15.20/464.80	NA	6,800	NA

WEEKLY DROUGHT EMERGENCY
MEASUREMENTS - DUBLIN, PA.

11/5/84

ORIGINAL
Data

Well	Surface Elevation M.S.L.	Water Level B.T.C./M.S.L.	Total Depth	Distance from Dublin #1 Well	Water Level change since 10/29/84
49 Stonebridge Well #10	460	41.20/418.80	NA	6,200	NA
50 S.B. Well #1 ⁺	490	72.30/417.70	NA	5,800	NA
51 Hoffman	480	NM	NA	5,900	NA
52 Bishop	505	NM	125	4,500	NA
53 Phillips	540	NM	NA	5,800	NA
54 Dublin Sewage Plant	530	NM NM	NA	9,300	NA
55 Tyson	490	24.18/465.82	NA	6,600	NA
(56) Rosenelli	500	73.10/426.90	250	4,416	+1.47
57 Dumire	460	NM	NA	5,424	NA
58 Stauffer	587	19.64/567.36	75	1,800	+3.08

<u>STREAM STATION</u>	<u>GAUGE HEIGHT (FEET)</u>
Station 1	13.25
Station 2	6.75
Station 3	9.60

(1) Key Monitoring Well

* Dug well - not currently used.

** Not actually measured - information given by Landowner.

NA Not available.

+ Measurements made by Stonebridge.

NM Not Measured.

P Pumping

X Neighboring well (Dumire, #57) is being measured in place of this well

ART Artesian Well

AR100120

APPENDIX II

STREAM FLOW AND BASE FLOW SUMMARY

AR100121

1984 - 1985

COMPILATION OF LOW-FLOW MEASUREMENTS

DUBLIN STUDY AREA

RATES IN GPD/MI²

	April 13	July 26	Aug. 28	Sept. 20	Oct. 8	Nov. 9	Jan. 9
STATION 1 Deep Run @ Stony Bridge Road. Uncor. Cor.	955,658	451,790	87,390	54,607	56,216	96,091	76,815
	946,900	421,400	78,632	45,849	47,458	87,333	68,057
STATION 2 Deep Run @ Irish Meeting House Uncor. Cor.	168,751	56,544	74,946	69,113	66,423	190,693	54,493
	131,058	18,851	37,253	31,420	28,730	153,000	16,800
STATION 3 Morris Run @ Old Beth. Pike Uncor. Cor.	589,785	147,072	53,050	63,425	44,138	336,619	N/M
	575,833	133,120	39,098	49,473	30,187	322,667	N/M
Average (Corrected)	571,398	218,468	71,795	62,381	55,592	207,801	N/A
Average (Uncor.	555,263	191,123	51,661	42,247	35,458	187,666	N/A

ORIGINAL
(Rad)

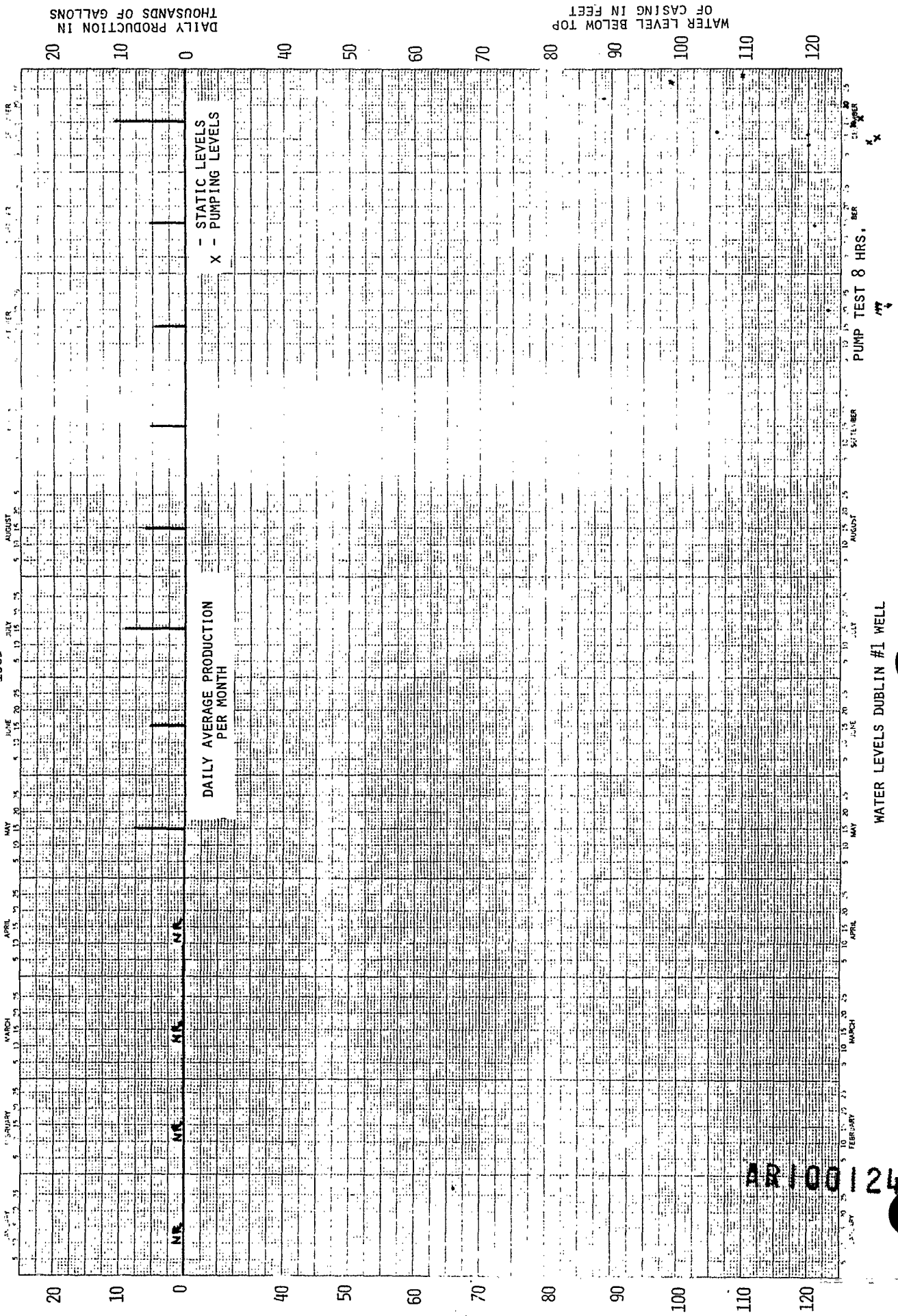
APPENDIX III

WATER LEVELS AND PRODUCTION IN THE

DUBLIN #1 AND #2 WELLS

AR100123

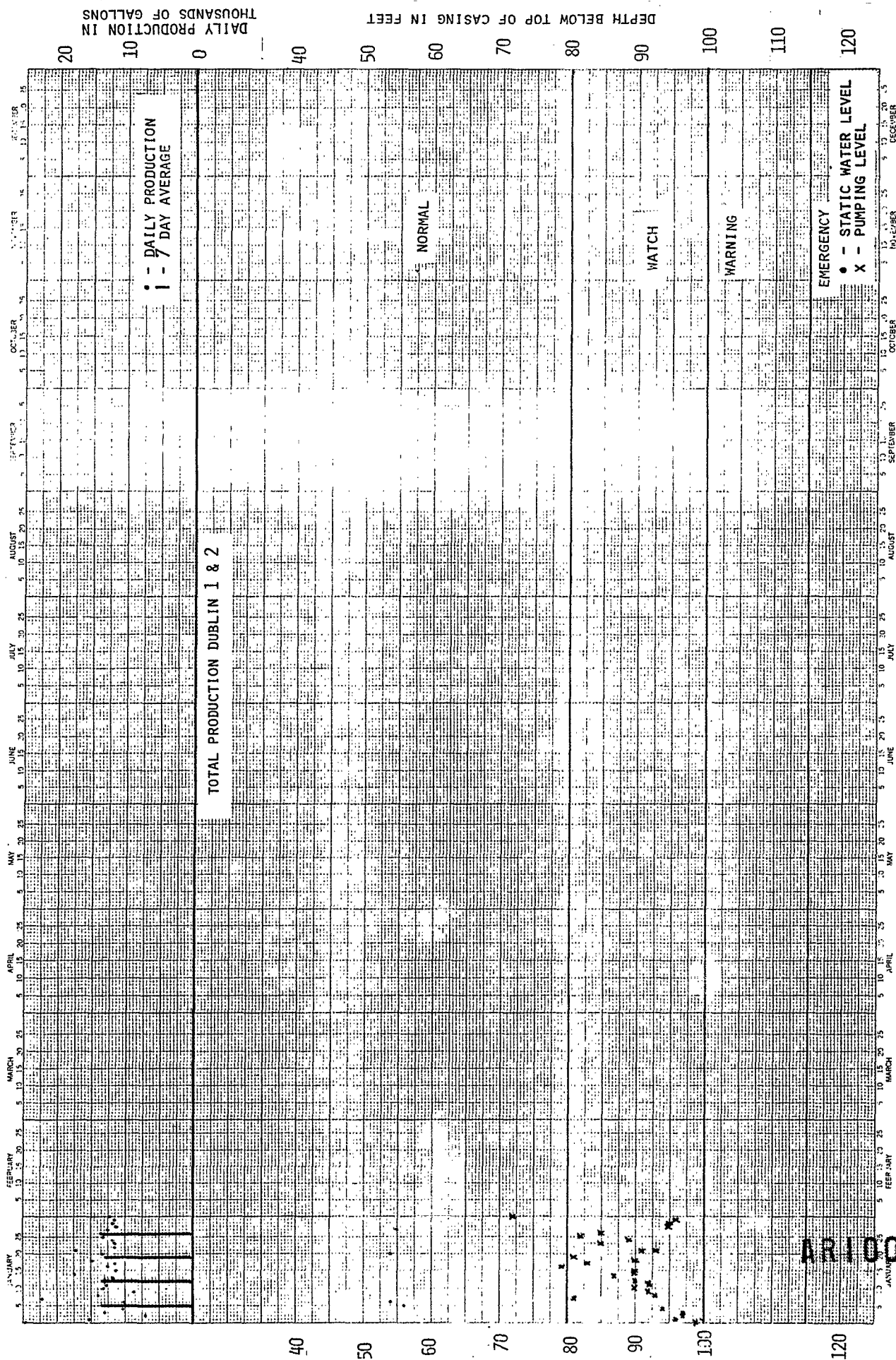
1983



AR 100 24

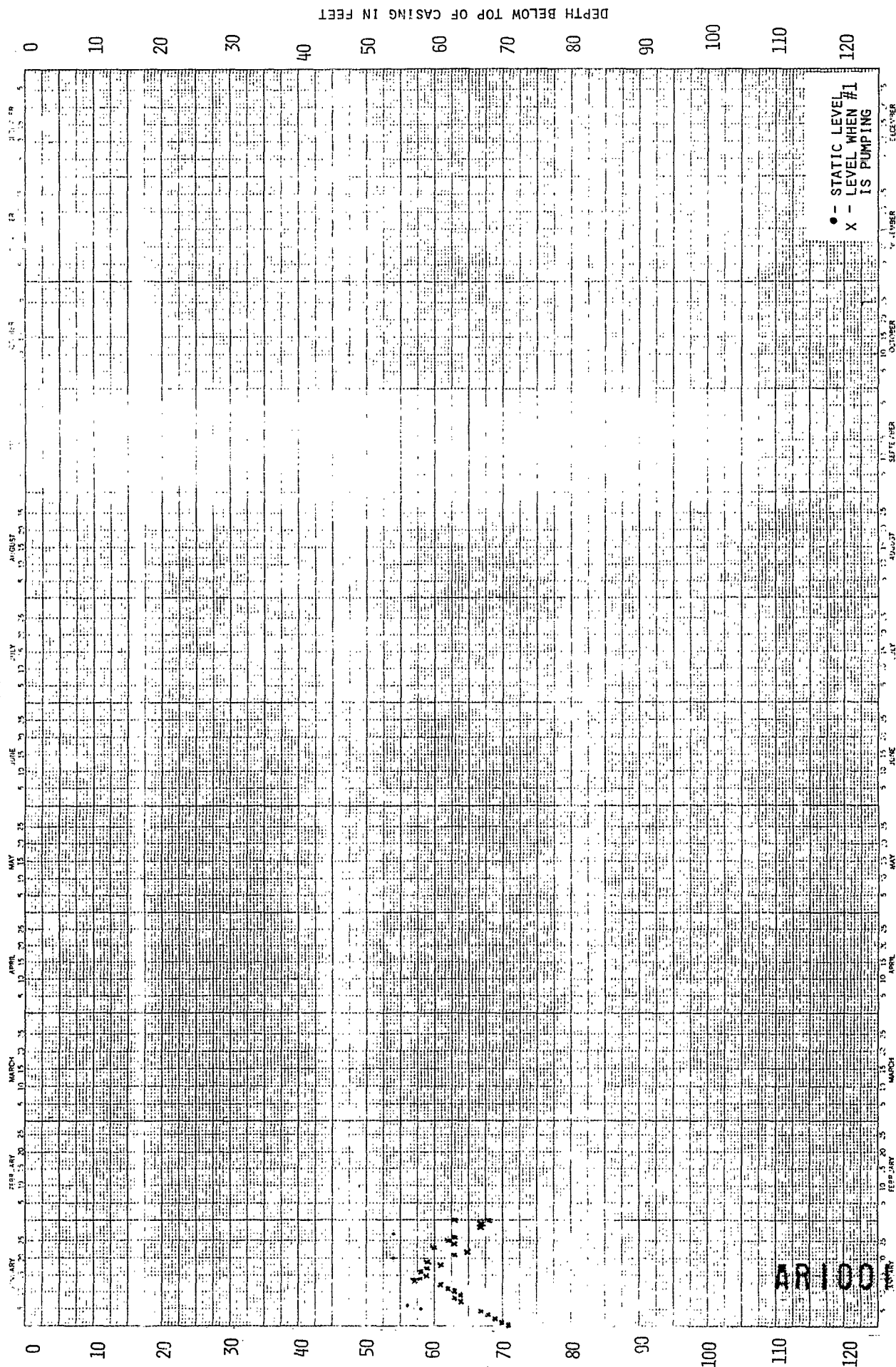
ORIGINAL
(Red)

1985



AR100125

1985



WATER LEVELS DUBLIN #2 WELL

AR-100 20

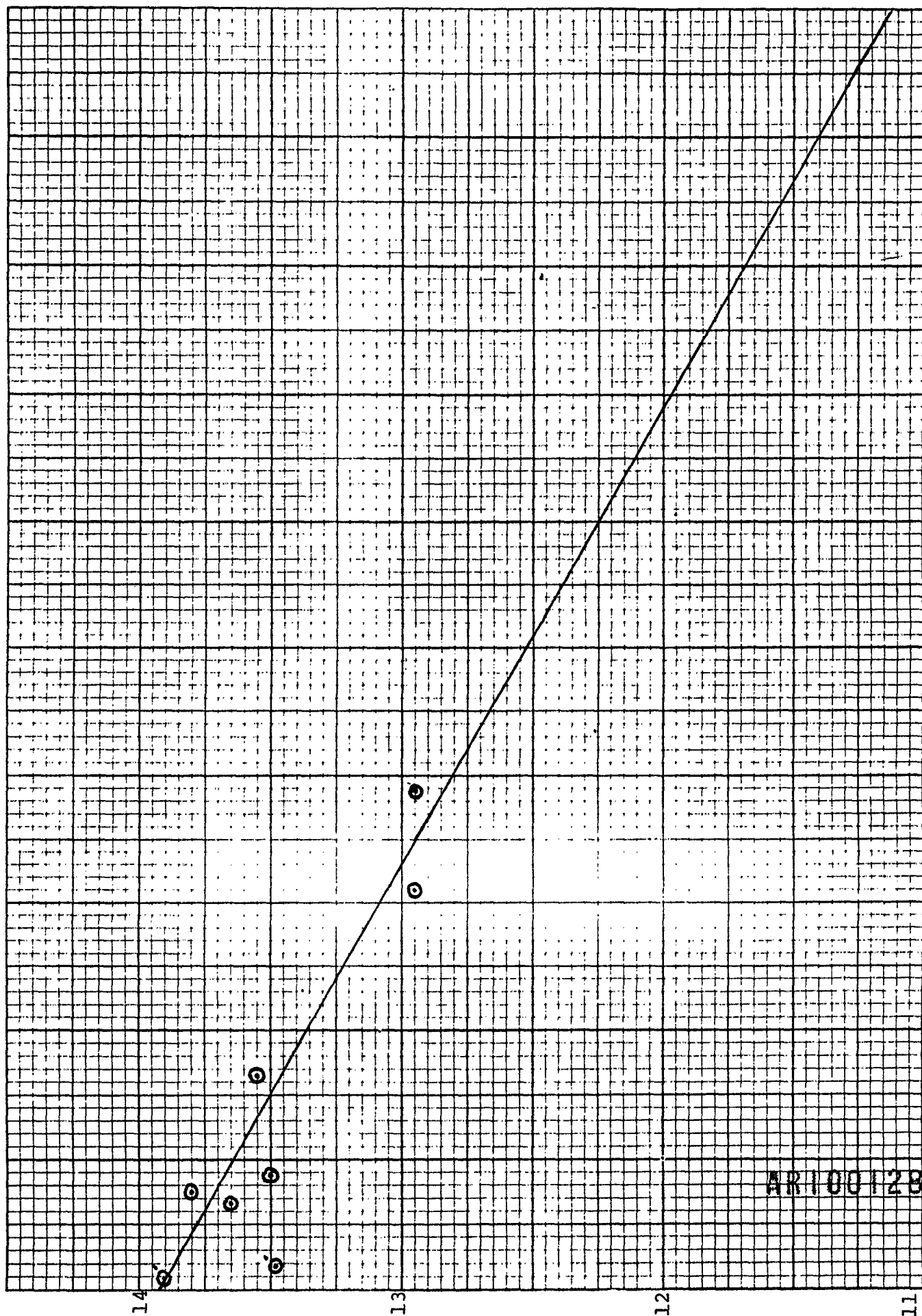
APPENDIX IV

PLOTS OF STAGE-DISCHARGE AND PROBABILITY

AT STREAM STATIONS 1, 2 AND 3

AR100127

DUBLIN STREAM STATION 1 TOTAL STREAM DISCHARGE TO GAUGE HEIGHT CORRELATION

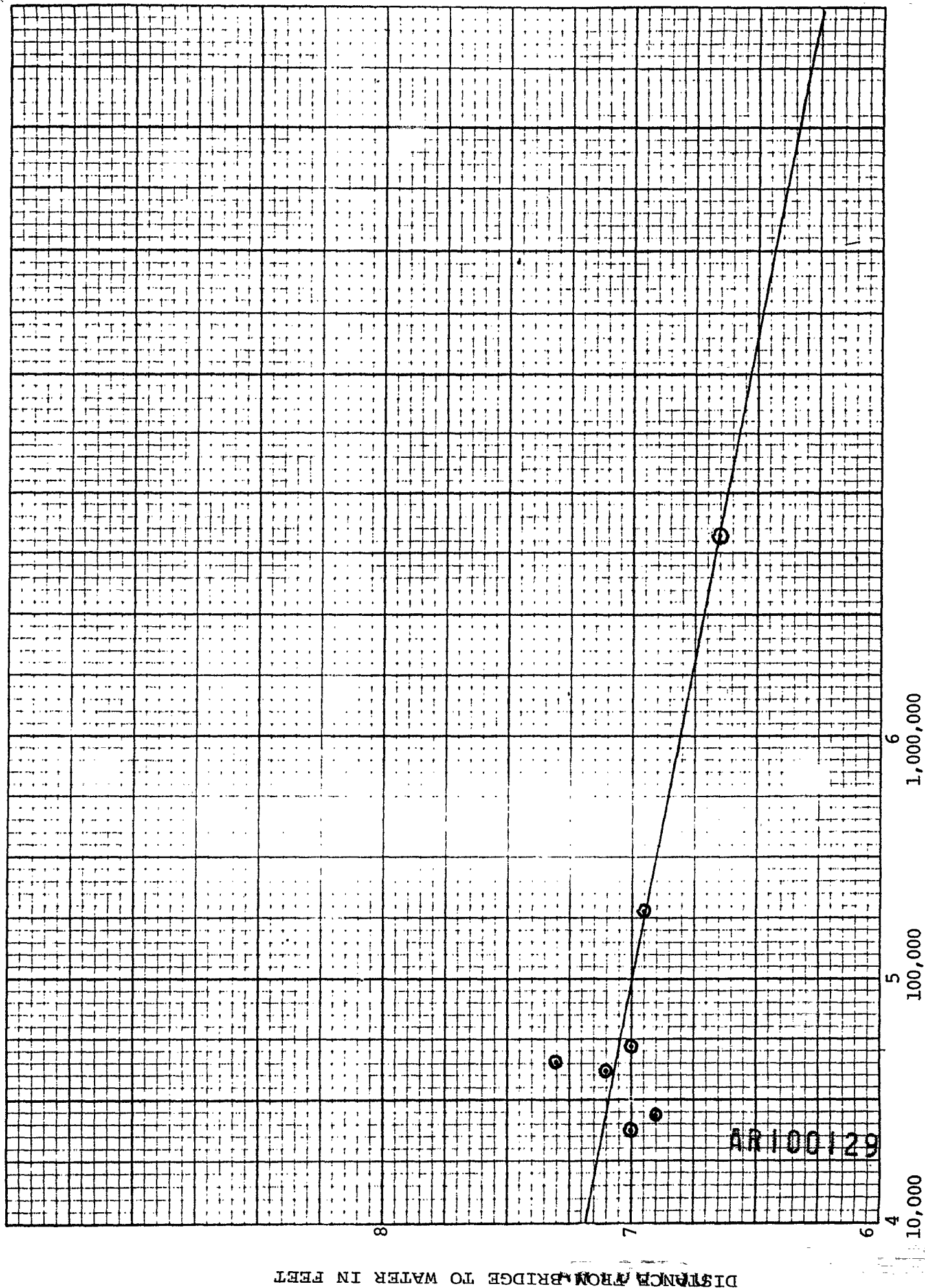


AR100128

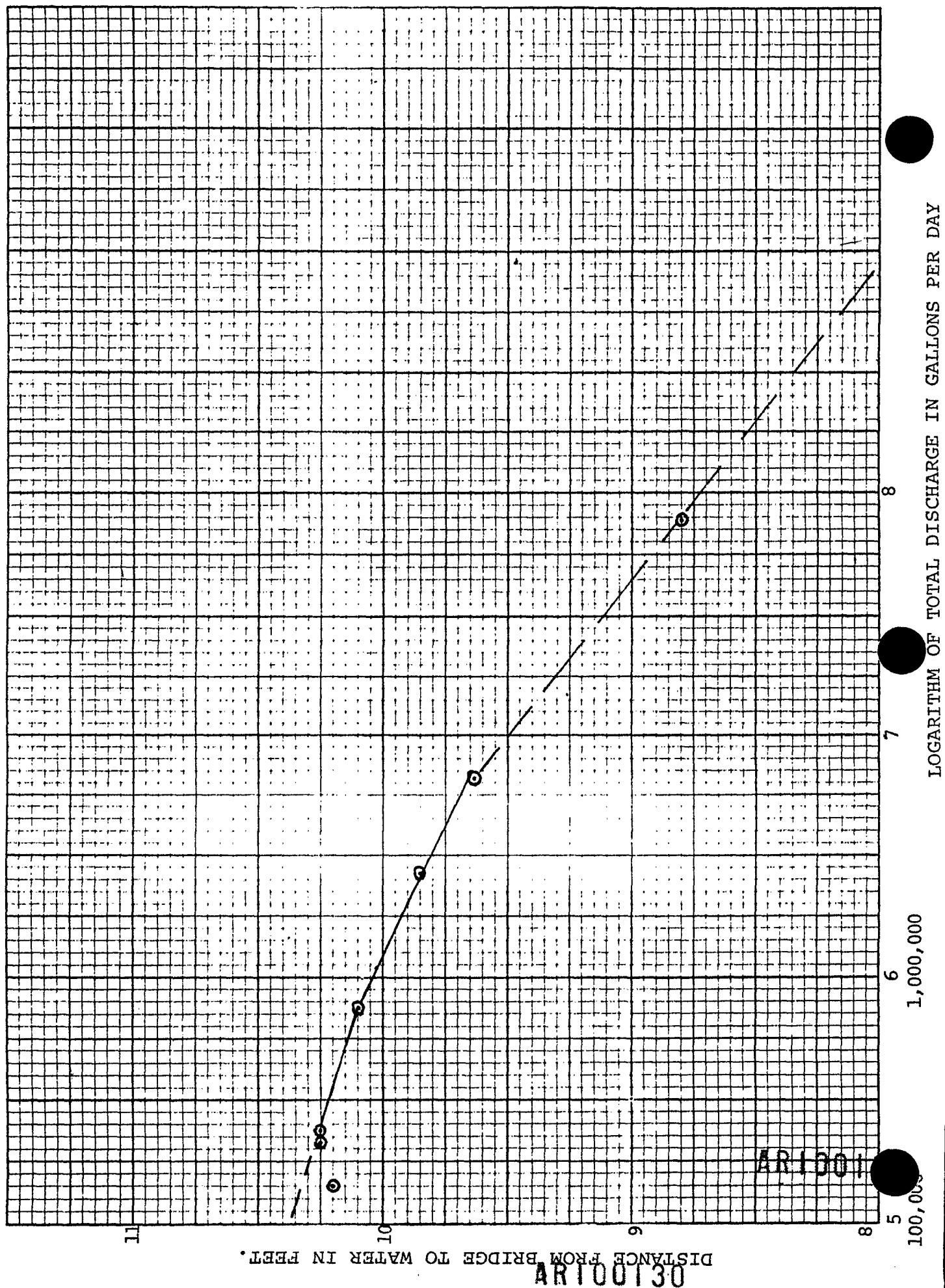
DISTANCE FROM BRIDGE TO WATER IN FEET.

TOTAL STREAM DISCHARGE IN CUBIC FEET PER DAY

DUBLIN STREET STATION 2
TOTAL STREAM DISCHARGE TO GAUGE HEIGHT CORRELATION



DUBLIN STREAM STATION 3
TOTAL STREAM DISCHARGE TO GAUGE HEIGHT CORRELATION

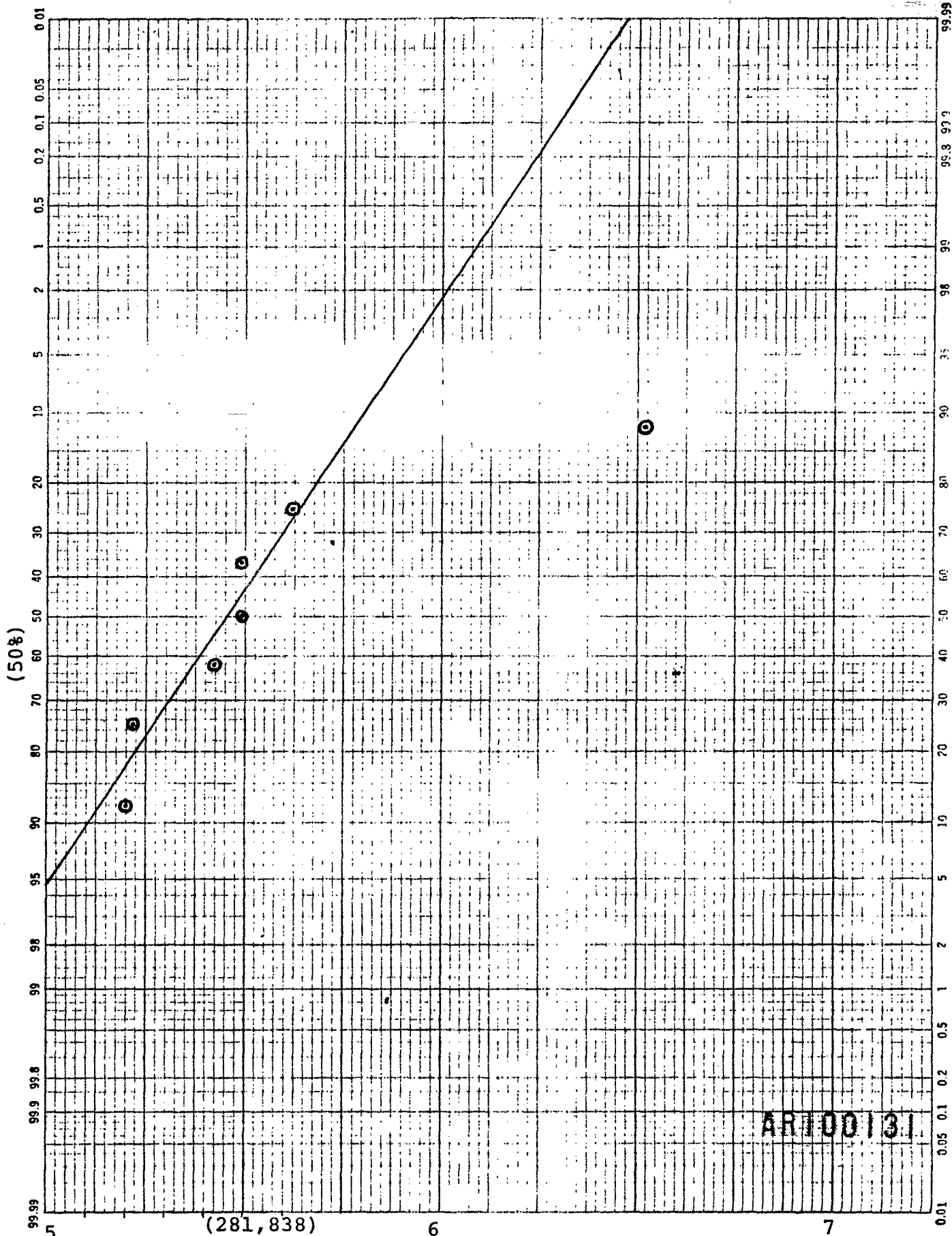


DUBLIN STREAM STATION 1*

 PROBABILITY CHART OF TOTAL BASE FLOW

 FROM APRIL 13, 1984 TO JANUARY 9, 1985

PROBABILITY THAT DISCHARGE WILL EXCEED GIVEN BASE FLOW

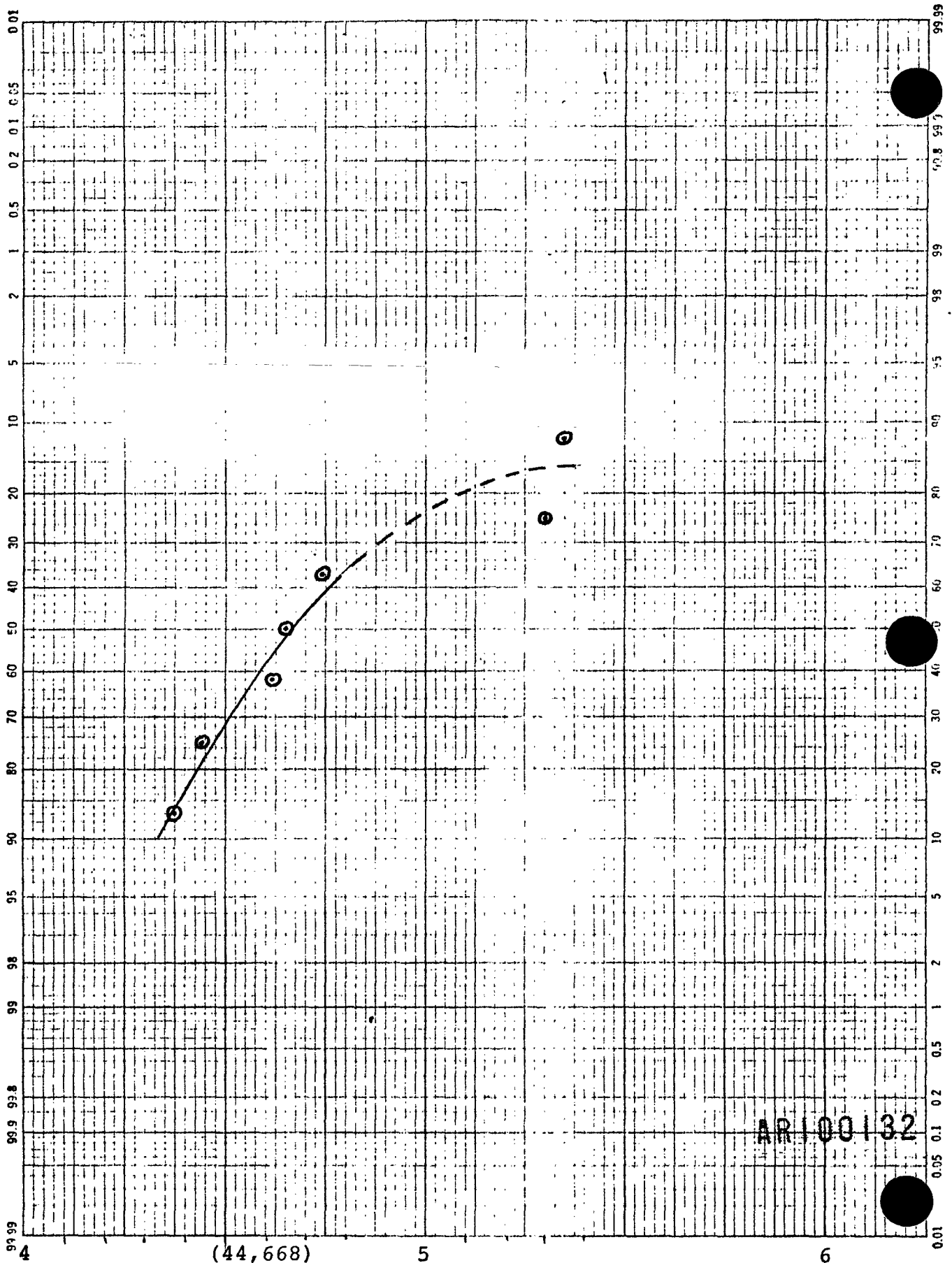


* (Drainage Area = 3.47 mi²)

DUBLIN STREAM STATION 2"
 PROBABILITY CHART OF TOTAL BASE FLOW
 FROM APRIL 13, 1984 TO JANUARY 9, 1985

(Rd)

PROBABILITY THAT DISCHARGE WILL EXCEED GIVEN BASE FLOW

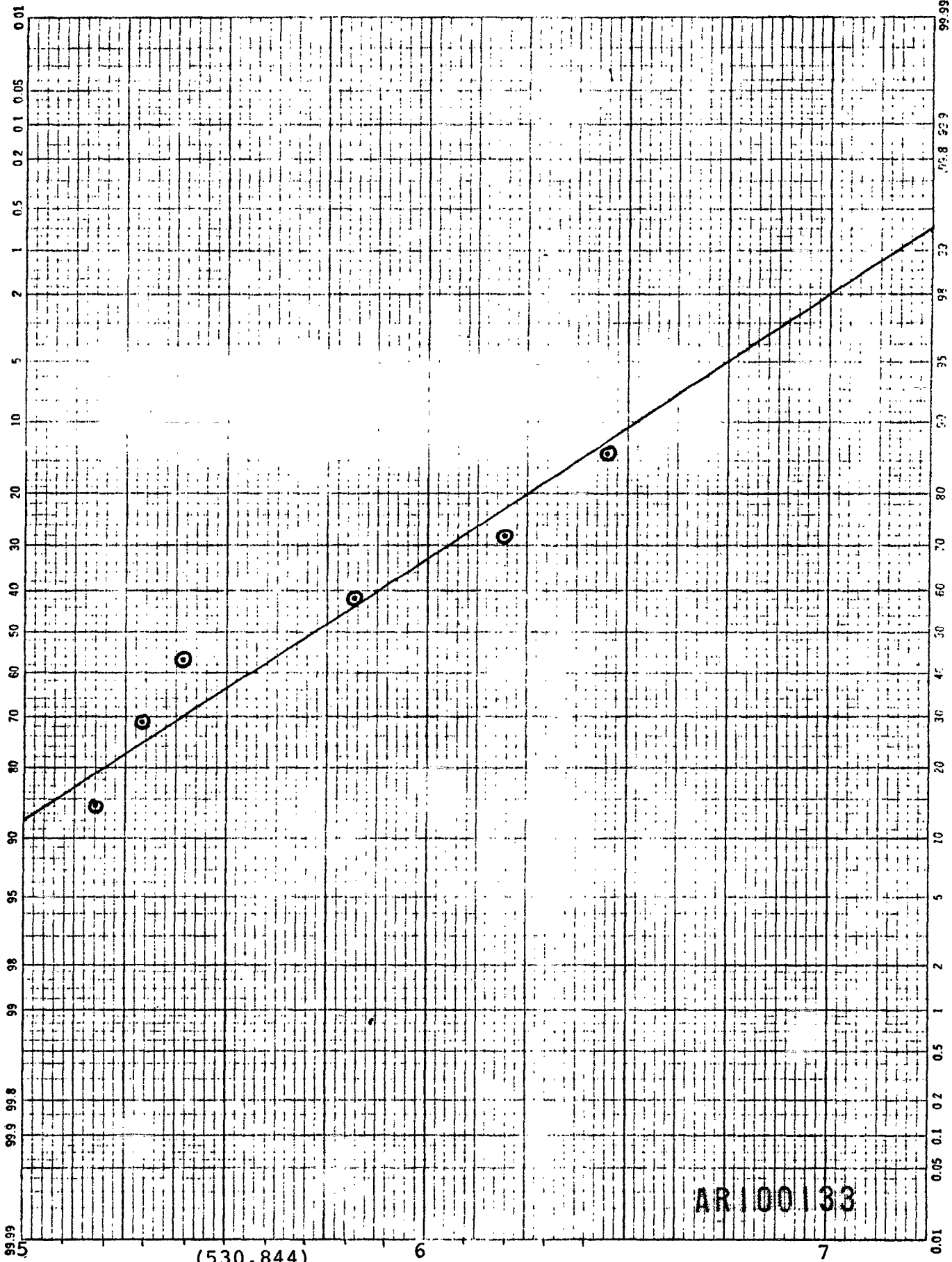


LOGARITHM OF BASE FLOW IN GALLONS PER DAY
 *(Drainage Area - 1.44 mi²)

DUBLIN STREAM STATION 3*
 PROBABILITY CHART OF TOTAL BASE FLOW
 FROM APRIL 13, 1984 TO JANUARY 9, 1985

PROBABILITY THAT DISCHARGE WILL EXCEED GIVEN BASE FLOW

(50%)



AR100133

LOGARITHM OF BASE FLOW IN GALLONS PER DAY
 *(Drainage Area = 4.86 mi²)

ORIGINAL
(Red)

APPENDIX V
COMPILATION OF GROUNDWATER MAPS
FOR THE DUBLIN AREA

AR100134

WEST BRANCH
DEEP RUN
WATERSHED

EAST BRANCH
DEEP RUN
WATERSHED

MORRIS RUN
WATERSHED

CHANGE IN GROUNDWATER LEVEL
Dublin Borough and vicinity
June 19, 1984 to December 3, 1984

AR100135

~ Change in Groundwater Level Conto
• Data Point
--- Topographic Divide
Scale 1" = 2000'

WEST BRANCH
DEEP RUN
WATERSHED

EAST BRANCH
DEEP RUN
WATERSHED

MORRIS RUN
WATERSHED

Groundwater Contour Map

10/22/84

Dublin Borough and Vicinity

Groundwater Contour

• 7 Data Point

--- Topographic Divide

Scale 1" = 2000'

Elevations in Feet above M.S.L.

WEST BRANCH
DEEP RUN
WATERSHED

EAST BRANCH
DEEP RUN
WATERSHED

MORRIS RUN
WATERSHED

Depth to Groundwater Map

10/29/84

Dublin Borough and Vicinity

Depth to Groundwater Contour

• 8 Data Point

--- Topographic Divide

Scale 1" = 2000'

STA 2

Irish
Meeting House

STA 1

Kings Corner

Dublin

Smith
Sch

Hunsberger
Sch

B E D M I N S T E R

D U B L I N

Griers Corner

N

AR100137

WEST BRANCH
DEEP RUN
WATERSHED

EAST BRANCH
DEEP RUN
WATERSHED

MORRIS RUN
WATERSHED

WATER LEVEL CHANGES
Dublin Borough and Vicinity
March 16, 1984 to Sept. 20, 1984

AR10013

AR100138

Scale 1" = 2000"

Change in Groundwater Level Contour

-3 Data Point

Topographic Divide

WEST BRANCH
DEEP RUN
WATERSHED

EAST BRANCH
DEEP RUN
WATERSHED

MORRIS RUN
WATERSHED

STAR

STAR

Irish
Meeting House

Kemp's Corner

Smith
Sch

Hunsberger
Sch

DUBLIN

B E D M I N S T E R

N

Groundwater Level Changes

9/20/84 to 10/22/84

Dublin Borough and Vicinity

— Change in Water Level Conto

.9 Data Point

--- Topographic Conto

Scale-1" = 2000'

AR100139

WEST BRANCH
DEEP RUN
WATERSHED

EAST BRANCH
DEEP RUN
WATERSHED

MORRIS RUN
WATERSHED

GROUNDWATER CONTOUR MAP
Dublin Borough and Vicinity

November 21, 1984

AR100140

Groundwater Contour

.501 Data Point

Topographic Divide

Scale 1" = 2000'

APPENDIX VI

PRECIPITATION IN 1984

AR100141

